

1. PROJECT MANAGEMENT (12/16/2003)

PURPOSE

Project management is a value-added process used to develop products to customers. The purpose of it is to include scheduling of work, internal and external coordination, maintain teamwork, hold partners accountable, manage finances, maintain professional work quality, balance competing demands, meet milestones, and facilitate communication throughout the process for all interests. While doing this it is committed to be flexible, utilize efficient approaches consistent with law and policy, and obtain results.

FUNCTION

In this study the Corps project manager (PM) will also function as the study manager and will work closely with the sponsor's PM and the project delivery team (PDT) in executing the study according to the principles described in the paragraph above. The Corps PM is the primary point of contact with the sponsor, the USACE, and other external interests, and is in charge of developing a written Project Management Plan (PMP), which includes baseline cost and schedule estimates and performance criteria. The Corps PM, in consultation with the sponsor PM, exercises management control by allocating funds to each technical or study function under Corps management, monitoring progress in meeting milestones, checking biweekly labor expenditures, reviewing documents from technical functions for compliance with the PMP, preparing project management reports, monitoring of contingencies, updating the PMP and preparing project schedule and cost change requests. The sponsor PM performs like functions. The sponsor PM tracks the progress of work contracted by the sponsor for the study, and keeps the Corps PM informed of this progress. The sponsor PM shall communicate to the Corps PM sponsor feedback, monitor Corps actions, and ensure that cost-share costs are fully documented and properly reported to the Corps PM. The Corps PM shall inform the sponsor what is expected of them, provide the sponsor necessary documents in a timely manner, keep the sponsor informed of study progress, monitor the sponsor's actions, and insure that local cost-share is properly entered into the Corps finance and accounting system.

Technical reporting is an important part of the PM's work, both to the Corps and to the sponsor. The purpose of the reports is to monitor accomplishment of project objectives and forecast upcoming issues and needed changes. Milestone reports are prepared so that the District workload may be planned. Expenditure reports are also prepared for budget planning. Various fact sheets are maintained for providing background information to higher authority or to respond to inquiries. Some informal internal reports are made for recording purposes. These include trip reports, telephone call memos and meeting summaries. These are kept in official files and in the unofficial files of the Corps PM. The sponsor is to be updated periodically on status of the project, as well as financial information related to the project that is consistent with public law and good business practice.

The Omaha District Commander, through the Deputy District Engineer for Project Management, is responsible for effective project management at the District. Management oversight is provided in the monthly Project Review Board (PRB) meetings

at the District, Division, and HQ levels. The District PRB approves the PMP and evaluates its execution. Changes to the PMP are to be endorsed by the sponsor and approved by the District. Changes to the PMP were described in the main PMP text in a section entitled “Change Control Procedures.”

TASKS

The scope of work includes 14 tasks that the Corps PM and Sponsor PM are responsible for during the course of the study. For planning purposes, this study is aggressively scheduled to take approximately 5 years to complete, so totals for recurring costs (e.g. maintenance of internal reporting products, monthly meetings, etc. . .) over the course of the entire study duration are shown in the budget sheet. Project Management costs may need to be revised and updated if the study schedule is extended substantially due to insufficient study funding.

1. Monitor, Revise and Update PMP, FCSA.

Review study compliance and update the PMP as required. If necessary revise the FCSA to meet any changes in scope and/or costs.

2. Maintenance of Corps Automated Information Systems (P2).

The Corps PM will set-up and maintain the new P2 project management automated information system for tracking study progress and monitoring execution.

3. Maintenance of Budget and Schedule Documents.

The Corp PM will maintain records of budget and schedule documents and provide input to the budget sheets, execution schedules, workload tracking spreadsheets, etc. . .

4. Attend Corps Project Review Meetings.

The Corps PM will prepare monthly reports for and attend internal Project Review Committee (PRC) meetings and Project Review Board (PRB) meetings and quarterly Division Review meetings. The purpose of these meetings is to communicate to the chain-of-command progress, significant developments, and any problems encountered during the conduct of the study.

5. Internal PDT Coordination.

The Corps PM will prepare for and host monthly team meetings with the PDT to monitor study progress, expenditures, and schedule future work. Meeting minutes will be documented, filed, and distributed to the PDT and Sponsor PM.

6. Federal, State, and Local Agency Coordination.

The Corps PM will maintain coordination with all of the study partnering agencies through periodic correspondence. The purpose of the coordination is to keep everyone informed as to study progress by the Corps PDT, monitor progress of work being performed by partnering agencies, and facilitate distribution and review of completed products.

7. Local Sponsor Coordination.

The Corps PM will prepare for and attend approximately 4 local Sponsor meetings, including monthly Yellowstone River Conservation District Council (YRCDC) meetings, Resource Advisory Committee (RAC) meetings, and/or Technical Advisory Committee (TAC) meetings per year over the course of the study. The Corps PM will also participate in teleconference or video teleconference meetings with the Sponsor when appropriate. Summary meeting minutes will be prepared for these meetings and distributed to the PDT and Sponsor for review.

The Sponsor PM will prepare for and attend all of the local Sponsor meetings and maintain coordination with the Corps PM in preparing for and documenting the meetings that the Corps PM does not attend. If and when appropriate, the Sponsor PM and any local Sponsor representatives are welcome to attend internal Corps PDT and project review meetings if they are in the Omaha area anytime during the course of the study.

8. Prepare and Execute Cooperative Agreements with Study Partners.

The Corps PM will work with the PDT and Sponsor PM to prepare Cooperative Agreements between the Corps and State and local agencies for conducting some of the technical studies. Each Cooperative Agreement will define the roles and responsibilities of each party, the scope of work, the estimated costs, and the cost-sharing requirements for that particular agreement. The Cooperative Agreements will be executed prior to work initiating on those technical studies.

9. Prepare Contract Scopes of Work and Select Contractors.

The Corps PM will work with the PDT and Sponsor PM to prepare detailed scopes of work for contracting technical studies. The Corps PM will work with Contracting Division to select an appropriate contract vehicle and prepare the solicitation. The Corps PM, PDT, and Sponsor PM will develop criteria for contractor selection and select a qualified contractor to do the work.

10. Monitor Contractor Progress and Send Payments for Completed Work.

The Corps PM will track contract study progress, review incoming bills, and send payments for work completed by the technical study contractors for contracts using either Federal funds or a combination of Federal and Sponsor funds. The Sponsor PM will perform like services for contracts utilizing strictly Sponsor funds. Corps PM and Sponsor PM will review contract deliverables to ensure they meet with the scope of work and comply with the quality assurance/quality control (QA/QC) requirements.

11. Monitor Study Financials and Prepare Reports.

The Corps PM and Sponsor PM will work together to monitor Federal and Sponsor cash expenditures, and Sponsor in-kind service credits. They will ensure that all in-kind services are properly documented and certified. Periodic reports documenting project execution will be prepared.

12. Respond to Study Inquiries.

The Corps PM review and respond to any inquiries that come from Congressional Delegates (or their staffs), Federal, State and local agencies, or other interested parties. Official correspondence will be staffed appropriately through the Corps chain-of-command. Responses will be coordinated with the Sponsor PM and copies of official correspondence will be provided to them for their records.

13. Set-up and Monitor Quality Assurance/Quality Control (QA/QC) and Independent Technical Review (ITR) Processes.

The Corps PM and Sponsor PM will ensure that all technical studies have an approved QA/QC Plan in place prior to the studies initiating. The Corps PM and Sponsor PM will monitor technical study progress and QA/QC documentation to ensure that the QA/QC Plan was adhered to and the review procedures are sufficiently documented. The Corps PM and Sponsor PM will facilitate the QA procedures that will usually be conducted by the Corps PDT and Sponsor TAC.

The Corps PM and Sponsor PM will coordinate with the partnering Federal, State, and local agencies, for distribution and review of the study final products. The multi-agency coordination and review effort will serve as the ITR for this study. The ITR comments will be documented, responded to, and incorporated into the final study reports, as necessary.

14. General Expenses.

General expenses include supervision and administration and clerical support for the study effort.

Yellowstone River Cumulative Effects Study
Project Management SOW Budget

16-Dec-03

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Task 11	Task 12	Task 13	Task 14	Task 15	Total
Total Costs	\$3,500	\$17,500	\$3,500	\$8,400	\$17,500	\$7,000	\$72,000	\$14,200	\$14,200	\$17,500	\$28,000	\$7,000	\$7,000	\$28,000	\$114,600	\$359,900
Contract Labor, Benefits, ODC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DNRC Labor, Benefits, Indirect, ODC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$62,200	\$62,200
USCOE labor, benefit, indirect, ODC	\$3,500	\$17,500	\$3,500	\$8,400	\$17,500	\$7,000	\$72,000	\$14,200	\$14,200	\$17,500	\$28,000	\$7,000	\$7,000	\$28,000	\$52,400	\$297,700
Non-Federal Cost Share	\$8,510	\$0	\$8,510	\$8,510	\$17,018	\$8,510	\$68,074	\$12,765	\$12,765	\$17,018	\$25,528	\$8,510	\$8,510	\$0	\$62,200	\$266,428
YRCDC In-Kind	\$8,510	\$0	\$8,510	\$8,510	\$17,018	\$8,510	\$68,074	\$12,765	\$12,765	\$17,018	\$25,528	\$8,510	\$8,510	\$0	\$62,200	\$266,428
YRCDC Cash	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Federal Cost	-\$5,010	\$17,500	-\$5,010	-\$110	\$482	-\$1,510	\$3,926	\$1,435	\$1,435	\$482	\$2,472	-\$1,510	-\$1,510	\$28,000	\$52,400	\$93,472

Task Descriptions	Deliverables
1 Monitor and Update PMP & FCSA	See PMP - Appendix A
2 Maintenance of Corps AIS (P2)	See PMP - Appendix A
3 Maint. of Budget & Schedule Docs	See PMP - Appendix A
4 Attend Corps Project Review Mtgs.	See PMP - Appendix A
5 Internal PDT Coordination	See PMP - Appendix A
6 Fed. State & Local Agency Coord.	See PMP - Appendix A
7 Local Sponsor Coordination	See PMP - Appendix A
8 Prep. & Exec. Coop. Agmts.	See PMP - Appendix A
9 Prep. Contract SOW & Select Cont.	See PMP - Appendix A
10 Monitor Contr. Progress & Pay	See PMP - Appendix A
11 Monitor Study Financials & Report	See PMP - Appendix A
12 Respond to Study Inquiries	See PMP - Appendix A
13 Set-up & Monitor QA/QC & ITR	See PMP - Appendix A
14 General Expenses	Supervision, administration, clerical
15 Travel & Per Diem	See PMP - Appendix A

Note - Contract labor = \$75 per hour; USCOE labor = \$100 per hour; DNRC labor = \$25 per hou

2. Public Participation

PURPOSE

Section 431 (b) of WRDA 1999 includes language that includes “consultation with the United States Fish and Wildlife Service, the United States Geological Survey and the Natural Resources Conservation Service and with the full participation of the State of Montana and tribal and local entities, and provide for public participation.” During the reconnaissance phase, many public meetings were conducted along the river and follow-up meetings were regularly held with the sponsor and its advisory and technical committees in preparation for the feasibility study. All of this has laid a solid foundation for the PMP. However, more needs to be done during the feasibility study in the area of dissemination of information, enabling timely access to the information developed in the study, and obtaining input on planning measures and alternatives.

STUDY TASKS

1. Establish Milestone Meetings for Public Input and Review.

Three series of meetings for interacting with river users and the general public would be conducted at several sites along the river corridor at selected milestones during the study process. The milestones and dates for the meetings will be determined by the PDT, TAC, and YRCDC but may include: study initiation, study technical report reviews, site review trips, formulation of alternative plans, review of interim technical reports, and review of the draft study report. The Corps and Sponsor PMs will prepare notices of these public meetings for release to the news media in the basin

2. Final Report Review Conference.

A public review conference will be held in conjunction with the release of the draft study report. The conference will occur over a couple of days and will consist of formal presentations for each of the technical studies, the cumulative effects analysis, and the recommended best management practices. The conference will be open to the public and the Corps and Sponsor PMs will prepare a public notice and invitation package that will be released to the news media throughout the Yellowstone River basin.

3. Public News Releases and Maintenance of the Study Web Site.

This task involves periodic release of study updates to news media throughout the basin. Study update news releases will be developed on a bi-monthly basis supplemented by additional releases for significant developments and public meeting notices as necessary. The Yellowstone River Conservation District Council (in cooperation with the Montana Department of Natural Resources and Conservation) has developed a web site for posting study information. Periodic updating and maintenance of the web site is also included in this task.

4. General Expenses.

General expenses for this scope of work will include rental fees and incidental equipment for meeting facilities and expenses for reproduction, fees, and postage for news releases and public notices.

5. Travel and Per Diem.

Travel costs are for travel to and attendance at the public meetings and final report review conference.

**Yellowstone River Cumulative Effects Study
Public Participation SOW Budget**

7-Jan-04

	Task 1	Task 2	Task 3	Task 4	Task 5	Total
Total Costs	\$70,800	\$16,000	\$51,000	\$1,700	\$18,940	\$158,440
Contract Labor, Benefits, ODC	\$0	\$0	\$0	\$0	\$0	\$0
DNRC Labor, Benefits, Indirect, ODC	\$0	\$0	\$30,000	\$0	\$0	\$30,000
USCOE labor, benefit, indirect, ODC	\$28,800	\$8,000	\$14,000	\$0	\$14,940	\$65,740
YRCDC Labor,Benefits, Indirect, ODC	\$42,000	\$8,000	\$7,000	\$0	\$0	\$57,000
YRCDC Cash	\$0	\$0	\$0	\$1,700	\$4,000	\$5,700
Non-Federal Cost Share	\$42,000	\$8,000	\$37,000	\$1,700	\$4,000	\$92,700
DNRC Labor,Benefits, Indirect, ODC	\$0	\$0	\$30,000	\$0	\$0	\$30,000
YRCDC Labor,Benefits, Indirect, ODC	\$42,000	\$8,000	\$7,000	\$0	\$0	\$57,000
YRCDC Cash	\$0	\$0	\$0	\$1,700	\$4,000	\$5,700
Federal Cost	\$28,800	\$8,000	\$14,000	\$0	\$14,940	\$65,740

Task Descriptions	Deliverables
1 Milestone Meetings	see PMP - Appendix A
2 Final Report Review Conference	See PMP - Appendix A
3 Public News Releases & Web Site	See PMP - Appendix A
4 General Expenses	See PMP - Appendix A
5 Travel and Per Diem	See PMP - Appendix A

3.0 TRIBAL CONSULTATION [07-JAN-2004] (final)

INTRODUCTION

The Department of Defense American Indian and Alaska Native Policy supports tribal self-governance and government-to-government relations between the federal government and tribes. One of the basic principals in the DoD policy is the recognition of the importance of increasing understanding and addressing tribal concerns, past, present, and future; and that these concerns should be addressed prior to reaching decisions on matters that may have the potential to significantly affect *protected tribal resources*.

“Protected Tribal Resources” is defined in the DoD policy statement as: *those resources and properties of traditional or customary religious or cultural importance, either on or off Indian lands, retained by, or reserved by or for Indian tribes through treaties, statutes, judicial decisions, or executive orders, including tribal trust resources.*

The U.S. Army Corps of Engineers relationship with tribes in the Omaha District is based on a government-to-government relationship in recognition of their tribal sovereignty. Furthermore, the Corps recognizes and respects the importance tribes ascribe to certain resources and properties based on traditional customary religious or cultural importance. It is therefore essential, that consultation take place in advance of a proposal that may have the potential to significantly affect tribal interests.

The most important element of consultation is to initiate the dialogue with potentially affected tribes *before* decisions affecting tribal interests are made. Consultation should include an invitation to potentially affected tribes to provide information concerning actions that may significantly affect tribal interests. Meaningful consultation demands that the information obtained from tribes be given particular, though not necessarily dispositive, consideration; this can happen only if tribal input is solicited early enough in the planning process that it may actually influence the decision to be made.

STUDY TASKS

All consultation activities for this project will be completed in accordance with the most recent version of the “Department of Defense American Indian and Alaska Native Policy,” the “Northwestern Division Native American Desk Guide” and the “Omaha District Draft Consultation Outline”. To complete consultation with the potentially interested tribes the following tasks will be completed.

3.1 Consultation Plan

The contractor will be required to complete a Yellowstone River Corridor Feasibility Study Tribal Consultation Plan. This plan will be coordinated with the Omaha District Project Manager and Native American Consultation Specialist. The plan, at a minimum shall contain the following subjects:

- a. Identify tribes with whom consultation should be established. These should be, at the minimum, tribes with cultural, religious, or historical connection to the Yellowstone River corridor. This will include the names of the Tribal Chairman, their addresses, phone numbers, FAX numbers, and e-mail address.

- b. Identify how information will be provided to the tribes during the consultation process. This will include identifying a tribal point of contact (POC), letters, phone calls, meetings, etc.
- c. A schedule for key project milestones, meeting dates, comment periods, draft plan reviews, and decision dates.

3.2 Tribal Scoping Meetings

It is important to explain the purpose and process to be followed in the development of the Cumulative Effects Study to those potentially affected Native American Tribes in the Yellowstone River Basin.

- a. Within 180 days from notice to proceed the contractor will arrange for three separate tribal scoping meetings with the tribes who were originally identified to solicit input on the Feasibility Study. The scoping meetings will be one day meetings. All three Tribal Scoping Meetings will be scheduled in the same week to minimize travel time.
- b. Contractor will prepare a letter that clearly describes the nature and scope of the study, provide a map which shows the areas of the study and provide meeting details. The letter shall be forwarded to the Omaha District, which will review and send out the letters. The letter will request that comments on the development of the Cumulative Effects Study be submitted to the Corps.
- c. Contractor will use the same presentations materials used for the public scoping meetings.
- d. Only 1 person from the Contractors office will attend the meetings. It is understood that the Corps of Engineers will attend all meetings and be responsible for running the meetings.
- e. Contractor will be responsible for arranging the schedules, the meeting facilities, take notes, be responsible for the meeting minutes, and any other incidentals that may be incurred.
- f. Contractor will prepare and submit a summary of each meeting. The summaries should include, a synopsis of the meeting, a list of the participants, the main concerns of the tribes, and transcript of the meeting.

3.4 Draft Cumulative Effects Study Report Review Meeting.

It is important for the tribes to participate and have an opportunity to provide input on the Draft Cumulative Effects Study Report. The tribal meetings are for the purpose of receiving oral and written comments on the document.

- a. Within 3 weeks after the Corps has sent the Draft Cumulative Effects Study Report out for public comment, the contractor shall arrange for three separate meetings with those same tribes who were identified as consulting tribes.
- b. The contractor shall draft a letter for transmission to the tribal Chairman and the tribal POC explaining the purpose of the meeting, the place, the time, and the agenda. The letter shall be forwarded to the Omaha District, which will review and send out the letters. All three Draft Cumulative Effects Study Report Review Meetings will be scheduled in the same week to minimize travel time.
- c. Contractor will use the same presentations materials used for the Public Draft Cumulative Effects Study Report Review meetings.

- d. Only 1 person from the Contractors office will attend the meetings. It is understood that the Corps of Engineers will attend all meetings and be responsible for running the meetings.
- e. Contractor will be responsible for arranging the schedules, the meeting facilities, take notes, be responsible for the meeting minutes, and any other incidentals that may be incurred.
- f. Contractor will prepare and submit a summary of each meeting. The summaries should include, a synopsis of the meeting, a list of the participants, the main concerns of the tribes, and transcript of the meetings.

3.6 Final Cumulative Effects Study Report Meeting.

It is important for the tribes to participate and have an opportunity to provide input on the Final Cumulative Effects Study Report. The tribal meetings are for the purpose of receiving oral and written comments on the document.

- a. Within 3 weeks after the Corps has sent the Final Cumulative Effects Study Report out for public comment, the contractor shall arrange for three separate meetings with those same tribes who were identified as consulting tribes.
- b. The contractor shall draft a letter for transmission to the tribal Chairman and the tribal POC explaining the purpose of the meeting, the place, the time, and the agenda. The letter shall be forwarded to the Omaha District, which will review and send out the letters. All three Final Cumulative Effects Study Report Review Meetings will be scheduled in the same week to minimize travel time.
- c. Contractor will use the same presentations materials used for the Public Final Cumulative Effects Study Report Review meetings.
- d. Only 1 person from the Contractors office will attend the meetings. It is understood that the Corps of Engineers will attend all meetings and be responsible for running the meetings.
- e. Contractor will be responsible for arranging the schedules, the meeting facilities, take notes, be responsible for the meeting minutes, and any other incidentals that may be incurred.
- f. Contractor will prepare and submit a summary of each meeting. The summaries should include, a synopsis of the meeting, a list of the participants, the main concerns of the tribes, and transcript of the meeting.

3.8 Final Report.

The contractor will submit a final report. The report will be a summary of the tribal consultation activities. It will include a summary of the results of the tribal consultation completed for the project as well as, meeting minutes, attendance sheets, correspondence, and documentation of phone calls.

3.9 General Expenses.

This task covers expenses for meeting room rental and equipment for all of the tribal consultation meetings.

DELIVERABLES

The contractor will submit to the Project Manager the following reports.

1. Consultation Plan.

The contractor will complete a consultation plan, 30 days following notice to proceed. Five copies of the draft consultation plan will be transmitted to the Omaha District for review. The Omaha District will have 15 days to review the plan and provide comments to the contractor. The contractor shall have 15 calendar days to incorporate changes, if any, and submit one copy of the revised final plan to the Omaha District.

2. Meeting Summaries.

The contractor shall prepare minutes for each meeting with interested parties, conducted during the execution of this contract. The meeting minutes shall give the reader the following information: Project name, Name of Meeting, Location of Meeting, Purpose of Meeting, Meeting Summary, Meeting Attendance List (Signatures with correct spelled names printed), and Agenda. Any pertinent information shall be attached the minutes (i.e., handouts, pictures, etc.) The meeting summary shall summarize all topics covered and shall highlight any action items required of the contractor, interested party or the Corps of Engineers. The summary can be in bullet format. One original and two copies shall be submitted to the Corps Project Manager of all meeting minutes.

3. Final Report

The contractor shall prepare a Final Report. The report will be a summary of the tribal consultation activities. It will include a summary of the results of each tribal consultation meeting, meeting minutes, attendance sheets, correspondence, and documentation of phone calls. Three copies of the Final Report shall be sent to the Omaha District.

Task/Deliverable	Schedule
Consultation Plan	15 days from NTP
Tribal Scoping Meeting Summaries	14 days after Meetings
Draft Cumulative Effects Study Meetings Summaries	14 days after Meetings
Final Cumulative Effects Study Meetings Summaries	14 days after Meetings
Final Report	30 days after Final Meetings

**Yellowstone River Cumulative Effects Study
Tribal Consultation SOW Budget**

7-Jan-04

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Total
Total Costs	\$3,000	\$6,900	\$1,952	\$6,900	\$1,952	\$6,900	\$1,952	\$3,200	\$1,400	\$34,156
USCOE labor, benefit, indirect, ODC	\$3,000	\$6,000	\$1,725	\$6,000	\$1,725	\$6,000	\$1,725	\$2,400	\$1,400	\$29,975
DNRC Labor, Benefits, Indirect, ODC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
YRCDL Labor,Benefits, Indirect, ODC	\$0	\$900	\$227	\$900	\$227	\$900	\$227	\$800	\$0	\$4,181
YRCDL Cash	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Non-Federal Cost Share	\$0	\$900	\$227	\$900	\$227	\$900	\$227	\$800	\$0	\$4,181
YRCDL Labor,Benefits, Indirect, ODC	\$0	\$900	\$227	\$900	\$227	\$900	\$227	\$800	\$0	\$4,181
YRCDL Cash	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Federal Cost	\$3,000	\$6,000	\$1,725	\$6,000	\$1,725	\$6,000	\$1,725	\$2,400	\$1,400	\$29,975
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Task Descriptions	Deliverables
1 Consultation Plan	see SOW
2 Tribal Scoping Meetings	3 Tribes, 1 meeting per tribe
3 Travel & Per Diem	see SOW
4 Draft Report Review Meetings	3 Tribes, 1 meeting per tribe
5 Travel & Per Diem	see SOW
6 Final Report Review Meetings	3 Tribes, 1 meeting per tribe
7 Travel & Per Diem	see SOW
8 Tribal Consultation Final Report	see SOW
9 General Expenses	see SOW

Note - USCOE labor = \$75 per hour

Note - YRCDL labor = \$25 per hour

4.0 Part A Riparian Vegetation Characterization [12-11-2003]

Purpose

The primary purpose of the riparian characterization is to gain an understanding of the plant community composition, structure, and dynamics along the Yellowstone River riparian corridor, and to evaluate the interrelationships that the riparian plant community has with invasive plant species infestations, channel geomorphology, river hydraulics, and in-channel fish habitat.

The second purpose of this characterization is to gain an understanding of local perspectives of significant historic and current land management factors and trends that directly affect riparian plant community health and floodplain function.

All characterization work will focus within the 260 miles of “representative reaches” located in segments from Springdale Bridge down to the confluence with the Missouri River. The Riparian Characterization Scope of Work will address the following objectives:

- Quantify the current and historical extent of the riparian forest cover along the Yellowstone River and document the change over the last 50 years.
- Develop a baseline of riparian plant community composition and structure on representative reaches including successional stage, special and horizontal variations, species diversity, density, age classes, patch dynamics, and exotic plant infestation.
- Document current and historic land use and management with riparian plant community health and extent. Land use change over time will be used as a gauge of cumulative effects.
- Utilize a spatial modeling process to derive an objective river corridor sensitivity index that will provide an objective basis for the recommendation and implementation of conservation practices.

This Scope of Work will utilize the Yellowstone River physical features inventory (Phase I and II) completed by NRCS in 2000 and 2001. Phase I was an aerial GPS mapping of physical features in and along the Yellowstone River’s active channel finished in September 2000. Phase II, completed in February 2003, was a ground-truthing of the Phase I mapping and included a functional evaluation of 25 – 40 % of the physical features (by county). Phase II was completed with local landowners and Conservation District Supervisors. Many of the landowner contacts that were made by NRCS during Phase I and Phase II will make it easier to proceed with this riparian characterization scope of work.

Relationship to Other Cumulative Effects Studies

The Riparian Characterization Scope of Work will be closely coordinated with all Yellowstone River Cumulative Effects Studies, but particularly with the Avian, Geomorphology, and Invasive Weeds Scopes of Work to reduce duplication and to fully complement data collection and interpretation. The riparian forest health and associated land uses and management will be compared with invasive weed infestations and the bird community/reproductive success for possible correlations.

Considerations

- ◆ There will be a sufficient number of field sites selected within the representative reaches (260 miles) to allow for a comprehensive characterization of the Yellowstone River plant communities. The location of these sites will be selected in a random, unbiased manner. Sites will be documented to provide for repeatable, long-term monitoring of trends.
- ◆ The riparian characterization scope of work will be fully coordinated with the other Yellowstone River Cumulative Effects Studies (CES) that will be occurring over the next five years (i.e. biological, socioeconomic, and geomorphic/hydraulic/hydrology).
- ◆ The 2001 color infrared (CIR) aerial photography acquired by NRCS, combined with the general land use and vegetation cover GIS mapping by NRCS, will be used as the base coverage for the riparian characterization.
- ◆ Landowners, natural resource agency personnel, local Conservation District supervisors, and river users will have the opportunity to actively participate in the riparian characterization. Their input on historical changes/trends, current management, and resource issues, associated with the Yellowstone River will be an important component of this scope of work. Landowner perspectives on the relative effectiveness of various conservation practices associated with the Yellowstone River corridor will be documented.

Required Study Tasks

NRCS will assign a team leader to organize/coordinate this effort and to assure consistency in the application of the assessment methodology and the quality of data collected from reach to reach.

The riparian characterization scope of work will include three tasks. These tasks will be completed throughout a three year time span.

Task 1: Quantify the current extent of riparian forest cover along the Yellowstone River and document the changes in riparian forest acreage over the last 50 years.

The objective for this task is to provide current and historic trends in riparian forest along the Yellowstone River. Three to four sets of historical aerial photography will be obtained, scanned, georectified, and incorporated into the GIS format under the Geomorphic Reconnaissance work scheduled to be completed by fall, 2003. The exact years of the photography are yet to be determined, but they will span at least 50 years.

This task will consist of photo interpretation and the on-screen digitizing of riparian forest boundaries using the georectified aerial photography for the “representative

reaches". Using ArcView, an overlay analysis of the riparian forest polygons for the different years will depict the extent and location of riparian forest cover change that has occurred in the last 50 years. This mapping will complement the land cover/use and vegetation cover mapping currently being completed by the Montana NRCS using August 2001 color infrared aerial photography (Minimum Map Unit: 10 acres).

Using Arc View Spatial Analysis, riparian forest polygons will be overlaid and correlated with the delineation of various flow frequency and flooded area curves (coordinated with Hydraulic/Hydrology Scopes of Work). Plant community species and age distribution patterns will be analyzed in response to discharge events and channel migration.

Deliverables

1. Intersecting layers quantifying the changes in the riparian forest along the Yellowstone River over the last 50 years. NRCS 2001 CIR photography (or more current photography) will be used as the base layer.
2. Map layers overlaying riparian forest polygons with various discharge event boundaries
3. Technical report that quantifies the riparian forest extent (by representative reach) over the last 50 years and outline riparian forest relationships with discharge events.

Task 2: Develop a baseline characterization of the riparian plant community. Where possible, correlations between riparian forest health and the current management of the riparian forest and adjacent lands will be made. Relationships between bank stability and riparian conditions will also be made where they might exist.

The objective of this task is to do a comprehensive characterization of the riparian forest at selected sites within the representative reaches. The NRCS's Riparian Assessment Worksheet (July 2000) will be completed at each site. This riparian assessment worksheet/methodology will be revised and/or supplemented to include the following data needs:

- Riparian Plant Community: Current successional stage, potential ecological state, species diversity, age class spatial distribution, density, exotic plant infestations, etc.
- The relative height and spatial distribution of age classes and species will be broadly defined by the Lidar topographic mapping. This mapping will be ground-truthed during the field characterization.
- Channel Bank Characterization: Bank erodibility rating (Rosgen, 1990) and channel stability indicators associated with riparian assessment sites.
- Historic and Current Management – Interview land managers on current and past management practices associated with the riparian forest along the Yellowstone River. Establish the role that current land use and management has on the river corridor conditions and assess the effectiveness of current conservation practices. Identify opportunities for future conservation practice adoption.
- Document baseline conditions for Conservation Practice/2002 Farm Bill Program effectiveness monitoring.

- Cumulative Effects – Establish land use/riparian health and river stability and bank stabilization relationships. This will be done in close collaboration with the other CES studies. Projected future riparian health scenarios and possible implications to river stability and function will be incorporated in the overall cumulative effects analysis.

Deliverables

1. Digital layer outlining riparian assessment rankings for the representative reaches. The NRCS 2001 CIRs will be used as the base layer.
2. Technical report documenting methodology, observations, and conclusions.

Task 3: Apply a *spatial modeling* process within a Geographic Information System (GIS) to derive an objective river corridor sensitivity assessment as a screening tool to identify biotic and abiotic differences between the representative reaches in response to disturbance.

The objective of this task is to derive a “sensitivity assessment index” that will indicate a response of the river system to disturbance (natural or anthropogenic). This index will be used in conjunction with other studies to help determine conservation needs and appropriate BMPs.

A linear model with appropriate values and weights will be applied to the following themes (except the Channel Reach theme):

- Channel Reach – classification of the position of the channel relative to its surroundings
- Vegetation Cover Diversity
- Land Use Sensitivity
- Flood Frequency
- Hydrologic Modifications
- Soil Vulnerability
- Buffer Effectiveness
- Urbanization

These layers will be generated from existing spatial data layers. Attributes and associated numeric ratings will be assigned. Via “layering” in GIS, an additive process will generate a new layer (sensitivity index) to which a cumulative numeric value (or range of values) will be derived. There will also be predictive scenario analysis done to assist with potential future conditions. Analysis will be conducted using ERDAS Model Maker or Arc View Spatial Analysis linear modeling software. The “sensitivity indexing” will provide land managers and agency personnel an objective basis for developing effective conservation practices.

Deliverables

1. Color-coded “resource sensitivity” maps (by representative reach) draped over digital orthophoto CIR base layer. Physical features data collected in 2000 and 2001 will be included in the base layer.
2. Technical report that documents methodology, rating tables, and assessment analysis.

Task 4: Quality Assurance/Quality Control (QA/QC)

Quality Control (QC).

The NRCS will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the NRCS and approved by the ACOE and the Yellowstone Technical Advisory Committee (TAC) prior to the initiation of the technical study. At the end of the study, the NRCS will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

Quality Assurance (QA).

A QA review will be performed to ensure that the NRCS has met the objectives of the Project Management Plan and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the Yellowstone TAC.

Projected Milestones

1. February 2004 to May 2004 – Develop detailed methodology that meets the intent of the Yellowstone CES and also provides a solid baseline for 2002 Farm Program effectiveness monitoring. Site selection within the representative reaches and landowner contacts will be made during this time period.
2. May 2004 to October 2005 - Conduct field site visits and collect pertinent data/information outlined in the scope of work.
3. October 2005 to March 2006 – Compile field data/write assessment report/conduct landowner follow-up.

Montana NRCS Contribution

- NRCS State Office Staff
 - ❖ 5 days – QA/QC Plan & Report
 - ❖ 35 days – Sensitivity spatial model application
 - ❖ 15 days pre-assessment logistics/preparation (Winter/Spring/2003).
 - ❖ 5 to 8 days per representative reach – Fieldwork (based on visiting 2 sites per day). Total: 65 days extended over a 3-year period (Field Seasons 2004/2005).
 - ❖ 30 days – Data compilation/Report Writing (Fall/Winter 2005).
- 150 staff days (\$60,000)
- NRCS State Biologist 4 to 6 days - Riparian Plant Community legend development (Fall/2003).
 - 6 staff days (\$3,000)

- NRCS Area Staff 17 staff days to assist in developing study design and detailed assessment methodology (Winter/Spring2003).
 - 17 staff days (\$7,000)
- NRCS Field Office and Area Office Staff 4 to 6 days in each representative reach – Task 2 fieldwork. (2004/2005)
 - 60 staff days (\$24,000).

Totals:	Staff Time:	\$94,000.
	Travel/Per Diem:	\$3,100.
	Equip/Supplies/Film	\$3,500.
	Inflation/Contingencies:	\$10,000.

State and Local Contribution

- Conservation District Supervisors/Employees: 2 to 4 days per representative reach on Task 2. There may also be additional days needed to make pre-assessment landowner contacts and to organize post-assessment and landowner meetings.

Time: 20 days	\$5,000.
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- Landowners: 4 to 7 days per representative reach (Task 2).

Time: 50 days	\$10,000.
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- Montana Department of Natural Resources and Conservation

GIS Support (DNRC funds - Contracted Services - Task 1 & 3):	\$17,000.
Office Support, Supplies (Task 1,2, & 3):	\$2,100.
- Yellowstone River Conservation District TAC

Quality Assurance	\$1,000.
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Yellowstone River Cumulative Effects Study Riparian Characterization Scope of Work

	Task 1	Task 2	Task 3	Task 4			
<u>Non-Federal Contributions</u>							Total
Landowner & CD Supervisor Labor		\$15,000					\$15,000
Travel Expenses & Office Support **	\$500	\$1,000	\$600				\$2,100
GIS Contracted Services *	\$9,500		\$7,500				\$17,000
Yellowstone TAC Members				\$1,000			\$1,000
Non-Federal In-Kind and Cash	\$10,000	\$16,000	\$8,100	\$1,000			\$35,100
<u>Federal Contributions</u>							
NRCS Labor & Benefits	\$4,000	\$83,000	\$5,000	\$2,000			\$94,000
Travel Expenses	\$600	\$2,000	\$500				\$3,100
Miscellaneous Expenses	\$500	\$2,000	\$1,000				\$3,500
Inflation/Contingencies	\$3,000	\$3,000	\$4,000				\$10,000
Federal (Non ACOE) Costs	\$8,100	\$90,000	\$10,500	\$2,000			\$110,600
Federal ACOE Costs				\$2,000			\$2,000
Total Cost	\$18,100	\$106,000	\$18,600	\$5,000			\$147,700

Task Descriptions						
Task 1: Quantify the riparian forest extent and document changes over the last 50 years.						
Task 2: Baseline characterization of the riparian plant community correlated with current use and management.						
Task 3: Application of a spatial model that will derive a sensitivity index for the stream corridor.						
Task 4: QA/QC						

* DNRC 310 Program Funds

** DNRC-CARDD office and vehicle support for NRCS employee

NRCS Labor & Benefits:

\$50./hour

Conservation District Supervisor Time: \$50./hour

Landowner Time: \$25./hour

4.0 Part B - Riparian/Floodplain Analysis: Avian Communities [1-05-2004 draft]

Purpose

The goal of this study is to evaluate how cumulative human factors influence avian populations and communities along the Yellowstone River. This knowledge will allow managers to determine the extent to which water management structures and rural residential development has modified natural communities.

Natural disturbances such as flooding are critical to maintaining biodiversity because they reinitiate succession in riparian vegetation and maintain the full range of seral stages. Periodic floods destroy old growth riparian forest in some places and create the gravel bars that allow riparian succession to begin anew elsewhere in the floodplain. Many free-flowing rivers create a dynamic steady state of seral stages, where the proportions of young, intermediate, and late seral habitats stay in the same proportions over time. Some native species are associated with each seral stage, hence the presence of the full suite of seral stages maintains habitat for a variety of species. This flood-dependent habitat dynamic is most pronounced in the braided reach type, where the flooding process to occur across a broader floodplain and maintains the greatest area of riparian habitat, the largest habitat patch sizes, and the highest bird biodiversity.

This study will assess the influence of water-management structures on bird population dynamics and community structure and the interactive effects of rural residential development. For sampling efficiency, we will focus on the cottonwood willow-shrub seral stage (Table 1) in the braided reach type. We hypothesize that water-management structures reduce the area of early seral riparian habitat below thresholds where bird populations are not able to maintain adequate reproduction and that the effects of rural residential development are pronounced in these settings due to the small patch sizes of early seral habitat and enhanced edge effects.

Specific objectives are as follows.

1. Determine how bird community structure and the abundance, reproduction, survival of selected bird species vary in early seral habitats in braided reach types between areas with various levels of water-management structures (levees, bank stabilization).
2. Evaluate the interactions between water-management structures and rural residential development in influencing bird communities and reproductive success of selected species.

Relationship to Other Study Efforts

This study will be done using reach classifications derived from the Geomorphic Analysis and the riparian habitat classes developed in the riparian vegetation study. We will attempt to select study sites that overlap to the extent possible with other projects funded under the Yellowstone River Corridor Study. This study will depend upon other funded

studies that will map the distribution of riparian vegetation and rural residential development.

Proposed Study Tasks

Experimental Design. Study sites will be stratified by density of water-management structures for early seral riparian habitat in the braided reach type. Within the strata of high water-control structures, we will also stratify by density of rural residences (Table 2). Five replicates will be sampled within each strata. Each replicate will be a representative-sized patch of suitable habitat. Aerial photograph interpretation will be used to quantify the aerial extent, spatial pattern, and intensity of land use (including rural homes) around each sample. Bird point counts, nest-search plots, survival studies, and vegetation surveys will be done at each site.

Bird Point Counts. Point counts are commonly used for assessing relative bird abundance, population trends, as well as determining habitat requirements. For the 2004 and 2005 breeding seasons we will survey birds at each census point using the standard point count method. Following standard point count protocol for western breeding birds, surveys will begin June 1st and proceeded to no later than July 15th. Surveys will be started at sunrise and ended no later than 10:00 a.m. Surveys will not be counted when high wind and rain (not drizzle) interfered with audible and optical detections. Each point will be censused three times over each of the two breeding seasons.

Vegetation and Land Use Quantification. For each bird census point a systematic protocol will be used for collecting vegetation measurements. Data collected will include tree density by diameter class and species, snag density by diameter class, coarse woody debris volume, shrub density by species, and herbaceous cover. Additionally, spatial patterns of riparian vegetation and land use will be quantified in 0.5, 1.0, and 3.0 km radius plots around each sample using aerial photographs.

Bird Reproductive Success. We will estimate reproductive output per nesting attempt across the study area for 3 species that are known to be sensitive to land use change and whose nests we know we can locate and monitor. We will use the methods of Martin and Geupel (1993) to locate and monitor nests on each site. We will sample 20 10-ha plots distributed among the braided reach type. The plots will be located to vary in density of in the surrounding area and in water-management structures. Nest searching will begin as soon as territory establishment begins in the spring (\geq mid-May) and conclude in late August when all nesting activities have concluded. Once located, nests will be monitored every 2-4 days. For each nest, we will record initiation date; numbers of host and cowbird eggs and young; fate for each nesting stage; number of fledgling host and cowbird young produced; nest-site characteristics (Martin and Geupel 1993); and landscape-scale characteristics. Thus, we will estimate nest success and female fledglings per nest attempt for a variety of species and settings: both variables are key to estimating reproductive output. This will be done within the 2005 and 2006 field seasons.

Bird Survival. Standard mark-recapture methods and mist netting will be used to estimate survival on the breeding grounds.

Statistical Analyses. Analysis of Variance will be used to evaluate the effects of water-management structures on riparian habitat attributes and bird populations and communities. Model selection and multiple regression will be used to examine the additional effect of rural home density on the bird response variables.

Quality Assurance/Quality Control (QA/QC)

PI Quality Control (QC).

The PI will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and TAC prior to initiation of the technical study. At the end of the study, the PI will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

Quality Assurance (QA).

A QA review will be performed to ensure that the PI has met the objectives of the scope and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the TAC.

Table 1. Seral stages of vegetation sampled in this study.

Vegetation strata	Age class
	Vegetation <10 years
Gravel bar	old
Meadow	N/A
Meadow with willow	N/A
	Cottonwood 11-20
Cottonwood willow-shrub	years old
	Cottonwood 21-80
Young closed-canopy cottonwood	years old
Mature cottonwood with an herbaceous understory	Cottonwood 81+ years old
	Cottonwood 81+ years
Mature cottonwood with a shrub understory	old
Meadow with willow	N/A

Table 2. Number of replicates of each strata.

Density of water- control structures	Rural Residential Development	
	Low	high
Low	5	0
Medium	5	0
High	5	5

Yellowstone River Cumulative Effects Study
Avian SOW Budget

	Task 1						Total
Total Costs	\$299,211	\$0	\$0	\$0	\$0	\$0	\$299,211
MSU Labor/Benefits/Travel/Supplies	\$232,056						\$232,056
MSU IDC	\$55,655						\$55,655
QA/QC (QC= 3% of \$287711 QA=1% of 287711)	\$11,500						\$11,500
Non-Federal Cost Share	\$134,765	\$0	\$0	\$0	\$0	\$0	\$134,765
MSU In-Kind	\$109,765						\$109,765
The Nature Conservancy***	\$25,000						\$25,000

Federal Cost	\$164,446	\$0	\$0	\$0	\$0	\$0	\$164,446
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Task Descriptions	Deliverables		
<u>Task</u>			
Task 1. 2 year Avian investigation (see description in Avian Scope of Work)	Data analysis and final report (see description in Avian Scope of Work)		
*** Verbal comitment of funds but not yet secured			

4.0 Part C - Fisheries Study (Revised 1-05-2004) Draft

PURPOSE

The purpose of this study is to evaluate the fish assemblage among various river reaches and relate assemblage characteristics to natural and modified reaches in the lower Yellowstone River. All comparisons will be made between reaches with comparable geomorphic characteristics. That is reaches that are geomorphically similar will be split into “control and treatment” groups for comparison purposes. The “control” reach will be defined as one that has experienced little to no modifications and the “treatment” being a reach that has significantly more modifications than the “control” reach. Modifications will include, but are not limited to, water intake structures, bridge abutments, barbs, weirs, and stabilization projects. Fish population data (relative species composition, species population estimates, etc.) will be collected within the control and treatment reaches and statistically compared to detect differences. These data will then be used to develop a cumulative effects analysis.

The following questions will be addressed during this study (all within the context of a cumulative effects analysis [CEQ 1997]):

- 1 How do in-river structures influence fish assemblage characteristics, such as species diversity, species richness, number of species of special concern, or number of invasive species?
- 2 How do in-river structures influence fish population dynamics, such as growth and mortality?
- 3 What are the relations among geomorphic variables and fish assemblage characteristics in natural and human-modified reaches?
- 4 What are the cumulative effects of human influences on fish assemblage characteristics and population dynamics?
- 5 What can be done to minimize the cumulative effects of human influences on fish populations?
- 6 What are the risks to the fish assemblage of continued development within the river basin?

RELATIONSHIP TO OTHER STUDY EFFORTS

This study is closely related to the geomorphic and hydrologic analyses. These studies will provide many of the variables used to assess the cumulative effects on fish assemblages and the Yellowstone River ecosystem.

STUDY TASKS

Quantitative information

Site selection and physicochemical sampling.-A hierarchical classification framework will be used to stratify sites based on data from the geomorphic study and conclusions from the 2003 fisheries study–Task 1. Sites selected (both modified and natural) will likely include: main channel, outside bend, inside bend, tributary mouth, connected secondary channel, non-

connected secondary channel (i.e., backwater). In addition, landscape-level factors such as flood plain encroachment, bank stabilization, and land use will be obtained from GIS databases and geomorphic analyses.

In-river physical parameters will be collected in conjunction with all fish sampling to identify fish habitat use within macrohabitats and among study reaches. Several habitat variables will be measured such as: depth, velocity, substrate type, bed form, water temperature, turbidity, conductivity, cover, location, and river stage. Further, reaches will be classified based on the amount of human impacts from the landscape (e.g., using GIS layers to evaluate land use) to in-river (e.g., enumeration of bank stabilization structures) scale.

Fish sampling.-The fewest sampling gears possible that effectively sample the greatest diversity of fish species in the widest variety of habitats will be used. Gears used will include beach seine, backpack electrofishing, boat electrofishing, benthic trawl, set gill nets, and drifting trammel nets. Fifty-six species are found in the Yellowstone River and all may be captured by these gears.

Fish sampling will be conducted using a stratified random sampling approach. Sampling will be stratified within reaches by macrohabitat and gear. All fish captured by all gears will be identified and enumerated. Total length and weight will be measured on all non-larval targeted taxa collected. Hard structures for age and growth analyses will be collected from commonly sampled species representing both long-lived and short-lived species. All sampling locations will be assigned GPS coordinates.

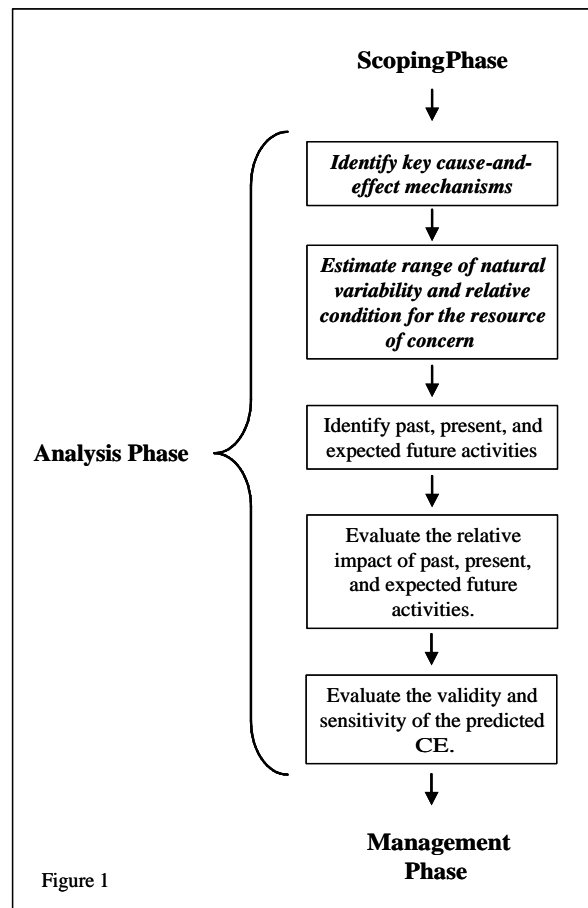
Sampling schedule.-Fish sampling will be conducted during the summer based on ecologically meaningful bounds (e.g., water temperature). This season was selected because the majority of flows are generally low, all macrohabitats are likely present, and a short duration sampling schedule should reduce within season temporal variability with respect to fish and macrohabitat measurements.

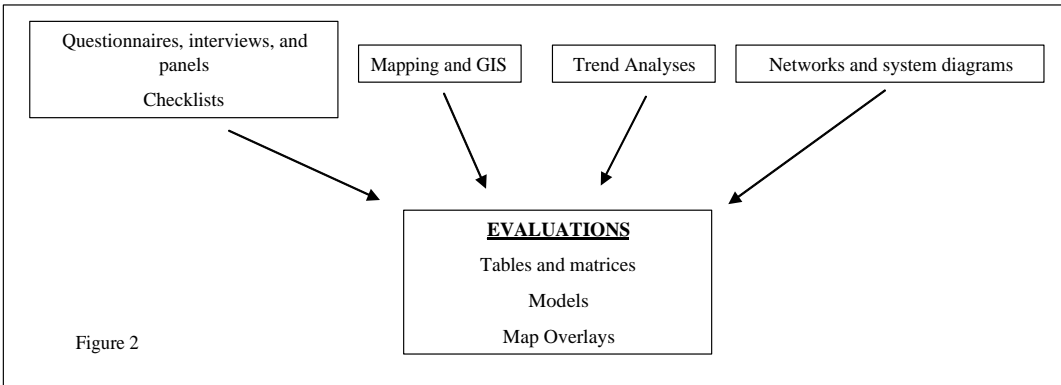
Data analysis.-Diversity, trophic guild diversity, tolerant species diversity, species richness will be analyzed by reach (modified and unmodified) and macrohabitats. Similarly, catch per unit effort (C/f; an index to density), growth, size structure, and mortality will be analyzed by reach and macrohabitats. All dependent variables will have GPS coordinates and included in a GIS layer of the lower Yellowstone River. Various statistical techniques (such as: analysis of variance (ANOVA), Kruskal-Wallis, multi-variate analysis of variance (MANOVA), canonical discriminate function analysis, and linear regression) will be used to compare response variables between reaches and macrohabitat within reaches. An alpha of 0.10 will be established as the criteria for statistical significance. An alpha of 0.10 is selected to reduce the likelihood of committing a Type II error.

Cumulative Effects Analysis

The quantitative data will be used to identify key cause-and-effect mechanisms and estimate the range of natural variability and relative condition for the fish assemblage in the lower Yellowstone River (Figure 1; modified from MacDonald 2000, a conceptual process for assessing cumulative effects). In addition to the quantitative analyses, we will identify past, present, and expected future activities; evaluate the relative impact of past, present, and expected future activities; and evaluate the validity and sensitivity of the predicted cumulative effects (Figure 1). Some of the latter analyses will be based on expert opinion and current knowledge because it is not possible to rigorously quantify all past, present, and future activities on fish community dynamics.

We will follow the primary methods for developing a conceptual causal model for cumulative effects (Figure 2) as outlined by the Council on Environmental Quality (1997). The cumulative effects model will be developed in close association with other studies and will likely fit into an overall cumulative effects model.





Quality Assurance/Quality Control (QA/QC)

PI Quality Control (QC).

The PI will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and TAC prior to initiation of the technical study. At the end of the study, the PI will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

Quality Assurance (QA).

A QA review will be performed to ensure that the PI has met the objectives of the scope and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the TAC.

DELIVERABLES

A technical report that describes the effects of in-river modifications on the fish assemblage in the lower Yellowstone River and a cumulative effects assessment of in-river and landscape-level factors on the fish assemblage.

A presentation to the Yellowstone River Conservation District Council highlighting the written report.

REFERENCES

- CEQ (Council on Environmental Quality). 1997. Considering cumulative effects. Government Printing Office.
- MacDonald, L. H. 2000. Evaluating and managing cumulative effects: process and constraints. Environmental Management 26:299-315.

TENTATIVE TIME LINE

Dec. 2004	Initiate Funding
Jan. 2005	Hire students and technicians
Feb.-Apr. 2005	Purchase equipment and confirm study locations
May-Aug. 2005	Sample fish assemblage at various reaches
Sept.-Dec. 2005	Sample and data analyses
Jan. 2006	Give update to YRCDC and hire technicians
Feb.-Apr. 2006	Purchase equipment and confirm study locations
May-Aug. 2006	Sample fish assemblage at various reaches
Sept.-Dec. 2006	Sample and data analyses
Jan.-June 2007	Compile additional data for analysis phase of cumulative effects study and write final report
August 2007	Final report and presentation

Yellowstone River Cumulative Effects Study
Fisheries SOW Budget

	Task 1				Total
Total Costs	\$193,889	\$0	\$0		\$193,889
MSU Labor/Benefits	\$103,740				\$103,740
Travel	\$16,200				\$16,200
Boat and Vehicle O&M	\$6,920				\$6,920
Supplies and expendables	\$16,000				\$16,000
Equipment	\$15,000				\$15,000
MSU IDC	\$28,572				\$28,572
QA/QC (QC= 3% of \$186,432 QA=1% of 186,432)	\$7,457				\$7,457
Non-Federal Cost Share	\$30,715	\$0	\$0		\$30,715
Overhead Waiver [21.5% of the total (total without equipment costs)]	\$30,715				\$30,715

Federal Cost	\$163,174	\$0	\$0	\$0	\$163,174
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Task Descriptions	Deliverables			
<u>Task</u>				
Task 1. 2 year Fisheries investigation (see description in Fisheries Scope of Work)	Data analysis and final report (see description in Fisheries Scope of Work)			

Yellowstone River Cumulative Effects Study Fisheries SOW Budget

[illegible][illegible]

Task Descriptions	Deliverables
Task 1. 3 year Fisheries investigation (see description in Fisheries Scope of Work)	Data analysis and final report (see description in Fisheries Scope of Work)

4.0 Part D - Invasive Plant Species Inventory & Analysis [1-05-2004 draft]

Purpose

The primary purpose is to characterize the problem in terms of geographic extent of invasive species invasion, and assess the effects on agricultural economy, riparian plant communities, channel geomorphology, river hydraulics, and avian species. The invasive plant species of primary concern are listed in Appendix A

Secondly, approaches to control will be evaluated to determine which would be most practical and cost-effective. Projections to arrive at expected future conditions will be made which will be available for identification of measures to be considered in plan formulation and development of a corridor plan. Extensive local input will be requested, including coordination among the Conservation Districts, branches of county, municipal government and consultation with federal and state experts.

The Invasive Plant Scope of work will address the following objectives. All characterization work will focus on 150 miles of selected “representative reaches” located in segments from Springdale down to the confluence with the Missouri River:

- Compile historical baseline data of Invasive plant infestations including species, density, and infestation sizes using interviews with landowners and other available data. This will include, but not be limited to the use of previous aerial Salt Cedar and Leafy Spurge data collected by the Bureau of Land Management in 1998 – 2001. The Yellowstone physical features inventory completed by the NRCS in 2000-2003 will also be utilized for this purpose.
- Field surveys will be conducted or in order to collect the data. Relate the distribution to historical or other factors, which have led to the infestation, which may provide clues to control measures. These may include flooding, bank disturbance, and contaminated seed or feed, or local ornamental sources. .
- Using spatial data collected from the Riparian, Avian, and Geomorphology studies relationships will be determined. From these relationships, conclusions can be drawn on the effects of each of these factors on one another. Thereby creating a more dynamic “tool box” to be used in best management practice creation and implementation.

Relationship to Other Cumulative Effects Studies

The Invasive Plant Species Inventory / Analysis holds a key relationship to many of the other study efforts. The closest coordination and sharing of efforts will be with the Riparian and Avian studies. This will eliminate duplication of efforts and aid in collecting of relative data between these concentric studies. Riparian health and bird species locations/populations will be correlated to determine possible interrelated effects.

As another example, the geomorphic study will provide information that may be used to track the movement or non-movement of invasive plants by the natural action of the river. The imagery

collected during the geomorphic, hydrologic, and hydraulics analysis will be useful in planning and implementing study task phases 2 and 3.

The determined economic impacts of the infestations and the management practices there should also be of use to the social-economic portion of this study. The long term economic impact of invasive plant species on the river corridor will be determinable from the data attained during the three phases of the Invasive Plant Species Inventory / Analysis studies.

Proposed Study Tasks

Under the direction of the Yellowstone County Weed Department information will be collected that is critical for detecting newly invading weeds, identifying boundaries of established weeds, developing long-term weed management goals and objectives, implementing action plans, and evaluating the status of weed management efforts in the state. Utilization of both photo points and GPS inventory are very important in these efforts. Site-specific information will be detailed with these methods so long term monitoring will be possible.

The Invasive Plant Inventory/Analysis Project will include three tasks. These tasks will be completed throughout a two-year time span.

Task 1: Compile and Assess existing Invasive Plant Research, Inventory, and Historical Data.

The objective of this task is to create a compendium of information to be used as baseline data. This information will not only be used to determine trend but as a reference in determining management practice development and implementation.

By using literature review together private & public land manager interviews, identify, if any, known impacts of invasive plant species on agricultural crops, grazing lands, native riparian communities, native fish and wildlife species populations, and channel capacity and stability.

Identify possible impacted cultural resources along the river corridor. Prioritized examples of these are Pompey's Pillar National Monument and Pictograph Caves. Identify possible impacts to both cultural resources and invasive plant populations due to increased public utilization of these sites.

Identify transportation corridors and river access points outside of the cultural resource areas. Use interviews and survey data to determine if these access points contribute to the expansion of invasive plant species populations.

Deliverables:

1. Map layers showing historical invasive plant species, size and location.
2. A compendium of other invasive plant species historical information that will include, but not be limited to:
 - Earliest known dates of infestation
 - Documentation of known plant origins and/or the zero infestation location
 - Control measures utilized to date and benefits/consequences thereof

Study Task 2: Aerial Invasive Plant Inventory

This task's objective is to produce GIS data to be used in determining the spread of Salt Cedar on the Yellowstone River. Salt Cedar inventories were completed in 1999, 2000, and 2001 during a cooperative project funded by the Bureau of Land Management. This inventory began at the Big Horn River and progressed to the confluence with the Missouri. This older spatial data would be used as an underlay to determine spread and rate of spread.

Additionally, control efforts conducted to date could be evaluated for success of suppression. By utilizing data from the other scopes of work, it might also be possible to determine stream bank change resulting from removal and restoration of native plant communities due to removal of the Salt Cedar.

Deliverables:

1. Spatial data representing the Salt Cedar location and density projected to match the 2000 NRCS CIR base layer.
2. Technical report detailing the status of the Salt Cedar infestation on the Yellowstone River

Study Task 3: Ground based data confirmation and collection.

Ground based data collection will be used in this task to collect the more detailed data about Salt Cedar (height, density, etc.). Additional Invasive plant data, including but not necessarily limited to the list in Appendix A, will be collected at this time. Representative reaches for like natural and modified reaches, as determined by the geomorphology scope will be used to create a representative cross section. A minimum of a pair of each reach class will be ground inventoried using GPS to collect spatial data and permanent photo points for ongoing monitoring. This will create several baseline locations to monitor future spread or the success of control measures.

Deliverables:

1. Spatial data representing the Salt Cedar location and density projected to match the 2000 NRCS CIR base layer.
2. Photo point data and permanent location information delivered to local managers

Study Task 4: Apply a process within a Geographic Information System (GIS) to determine differences in invasive plant infestations between disturbed and undisturbed representative reaches. In addition, create a compilation summary report of tasks 1, 2 and 3.

By combining the GIS, data gathered in study tasks 1, 2, and 3 a spatial model can be created. By examining the data in this "picture" format, conclusions can be drawn. For example, is there a difference in invasive plants in armored and unarmored reaches of the river? This would also allow prediction of what invasive plants may occur if an unmodified portion of the river is changed.

Deliverables:

1. Detailed maps showing areas of comparative invasive plant infestation between modified and unmodified reaches of the river.
2. Report detailing the methods used in creating the conclusions.
3. Combined report summarizing the data from study tasks 1, 2, 3 and 4.

Task 5: Quality Assurance/Quality Control (QA/QC)

Quality Control (QC)

The YELLOWSTONE COUNTY WEED DEPT. will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the YELLOWSTONE COUNTY WEED DEPT. and approved by the ACOE and the Yellowstone Technical Advisory Committee (TAC) prior to the initiation of the technical study. At the end of the study, the YELLOWSTONE COUNTY WEED DEPT. will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

Quality Assurance (QA)

A QA review will be performed to ensure that the YELLOWSTONE COUNTY WEED DEPT. has met the objectives of the Project Management Plan and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the Yellowstone TAC.

Projected Milestones

1. December 2003 – Receive Approval on MACD grant to fund task 1
2. December 2003 – April 2004: Complete Study Task 1
3. February 2003 – Receive approval for MNWTF grant based on needs from study tasks 3 and 4 and the additional educational component required by the MNWTF.
4. July 2004: Begin Study Task 2
5. July 2004 – September 2004: Complete Study Task 3
6. September 2004 – July 2005: Complete Study Tasks 4 and 5

Additional Information

As part of the Montana Noxious Weed Trust Fund Grant application, we have included an interactive education program. This will create an online resource to not only deliver the results from the CES invasive plants study but also create a framework for additional invasive plant education.

The intent of this project is to elevate the skill level of private and public land managers and inspire cooperation by opening lines of communication that are currently not readily accessible.

Appendix A

Weed & Plant Species of Concern

Category 1 Noxious Weeds

Category 1 includes thirteen noxious weeds infesting about 8 million acres that are generally widespread in many counties of the state. These weeds, such as spotted knapweed and leafy spurge, are capable of rapid spread and render land unfit or greatly limit beneficial uses. Management criteria include awareness and education, containment and suppression of existing infestations and prevention of new infestations. Species currently known to be in the Yellowstone River Corridor are:

Canada Thistle (*Cirsium arvense*)
Field Bindweed (*Convolvulus arvensis*)
Whitetop or Hoary Cress (*Cardaria draba*)
Russian Knapweed (*Centaurea repens*)
Spotted Knapweed (*Centaurea maculosa*)
Diffuse Knapweed (*Centaurea diffusa*)
Dalmatian Toadflax (*Linaria dalmatica*)
St. Johnswort (*Hypericum perforatum*)
Sulfur (Erect) Cinquefoil (*Potentilla recta*)
Common Tansy (*Tanacetum vulgare* L.)
Hounds Tongue (*Cynoglossum officinale* L.)

Category 2 Noxious Weeds

Category 2 includes seven noxious weeds infesting about 86,000 acres of Montana lands. These weeds have recently been introduced into the state or are rapidly spreading from their current infestation sites. These weeds, such as dyers woad and tansy ragwort, are capable of rapid spread and invasion, rendering lands unfit for beneficial uses. Management criteria include awareness and education, monitoring and containment of known infestations and eradication where possible. Species known to be in the Yellowstone River Corridor are:

Purple Loosestrife or Lythrum (*Lythrum salicaria*, *L. virgatum*, and any hybrid crosses thereof)
Tamarisk [Salt cedar] (*Tamarix* spp.)

Category 3 Noxious Weeds

Category 3 noxious weeds include yellow starthistle, common crupina, and rush skeletonweed, which have either not been detected in the state or may be found only in small, scattered, localized infestations. There are 38 acres of these weeds reported in the state. Management criteria include awareness and education, early

detection and immediate action to eradicate infestations. These weeds are known pests in nearby states and are capable of rapid spread and render land unfit for beneficial uses. Species known to be in the Yellowstone River Corridor are:

Yellow Starthistle (*Centaurea solstitialis*)

Non-Noxious Invasive Plant Species

Russian Olive (*Elaeagnus angustifolia* L.)

Threatened and Endangered Plant Species

Threatened and endangered plant species that may exist along the river corridor will be identified during the research completed in Study Task 1. An attempt will be made to locate and catalog these, if possible, in Study Task 3.

PRELIMINARY BUDGET

SUBJECT TO CHANGE

STUDY TASK 1

**Compile and Assess Existing Invasive Plant Research, Inventory And
Historical Data - Begin As Soon As Possible**

<u>Description</u>	<u>Quantity</u>	<u>Price Each</u>	<u>Total</u>
Research Hours	210	\$ 35.00	\$ 7,350.00
Compilation Of Data	110	\$ 35.00	\$ 3,850.00
GIS Data Analysis	110	\$ 35.00	\$ 3,850.00
Lodging Expense Fed Summer Rate	7	\$ 50.00	\$ 350.00
Perdium	7	\$ 15.00	\$ 105.00

Existing Research Total \$ 15,505.00

STUDY TASK 2

Aerial Invasive Plant Inventory

<u>Description</u>	<u>Quantity</u>	<u>Price Each</u>	<u>Total</u>
Helicopter Hours	140	\$ 400.00	\$ 56,000.00
Wages (Three Crew Members) 15% / Hour added for benefit	140	\$ 31.05	\$ 4,347.00
Mileage and Fuel Expense	2000	\$ 0.40	\$ 800.00
Lodging Expense (Three Rooms Per Day 15 days) Fed Summer Rate	50	\$ 50.00	\$ 2,500.00
Perdium	50	\$ 15.00	\$ 750.00
Data Processing Hours	75	\$ 35.00	\$ 2,625.00
Technical Services	75	\$ 35.00	\$ 2,625.00
Misc Supplies	1	\$ 1,000.00	\$ 1,000.00

Survey A Total \$ 70,647.00

STUDY TASK 3

**Ground Truth Study Reaches
Begin August 2003 (Upon Completion of Survey B)**

<u>Description</u>	<u>Quantity</u>	<u>Price Each</u>	<u>Total</u>
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Wages (Three Crew Members) 15% / Hour added for benefit	140 \$	31.05 \$	4,347.00
Mileage and Fuel Expense	3000 \$	0.40 \$	1,200.00
Lodging Expense (Three Rooms Per Day 15 days) Fed Summer Rate	19 \$	50.00 \$	950.00
Perdium	19 \$	15.00 \$	285.00
Data Processing And Report Writing	75 \$	35.00 \$	2,625.00
Technical Services	75 \$	35.00 \$	2,625.00
Misc Supplies	1 \$	1,000.00 \$	1,000.00
Ground Truth Total \$			13,032.00

STUDY TASK 4

**Apply a spatial modeling process within a Geographic Information System (GIS)
to determine differences in invasive plant infestations between disturbed and undisturbed
representative reaches. In addition create a compilation summary of tasks 1,2 & 3**

Data Processing And Report Writing	50 \$	35.00	\$ 1,750.00
Technical Services	50 \$	35.00	\$ 1,750.00
Copy Costs and Supplies	1 \$	1,000.00	\$ 1,000.00
Study Task 4 Total \$			4,500.00

Study Task 5

Quality Assurance/Quality Control (QA/QC)

Quality Assurance	\$ 1,000.00	\$ 1,000.00
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Study Task 5 Total \$ 1,000.00

All Project Total \$ 104,684.00

Yellowstone River Cumulative Effects Study Invasive Plant Species Inventory & Analysis

	Task 1	Task 2	Task 3	Task 4	Task 5	Other **	
<u>Non Federal Contributions</u>							Total
Montana Noxious Weed Trust Fund*			\$13,032.00	\$4,500.00		\$7,000.00	\$ 24,532.00
Yellowstone County Weed Dept.					\$1,000.00		\$ 1,000.00
Nature Conservancy***		\$ 20,000.00					\$ 20,000.00
Non-Federal, In-Kind and Cash	\$ -	\$ 20,000.00	\$13,032.00	\$4,500.00	\$1,000.00		\$ 45,532.00

<u>Federal Contributions</u>							
MACD Funds*	\$15,505.00						\$ 15,505.00
							\$ -
							\$ -
							\$ -
							\$ -
							\$ -
Federal (Non ACOE) Costs	\$15,505.00	\$ -	\$ -	\$ -	\$ -		\$ 15,505.00

Federal ACOE Costs		\$ 50,647.00			\$7,080.00		\$ 57,727.00
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Total Costs	\$15,505.00	\$ 70,647.00	\$13,032.00	\$4,500.00	\$8,080.00		\$118,764.00
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* Being applied for but not yet secured

** This is the related costs of the producing the educational component Montana Noxious Weed Trust Fund Grant

*** Verbal comitment of funds but not yet secured

4.0 Part E – Water Quality [12-29-2003 draft]

PURPOSE

The water quality study will: 1) provide a description of man's influence on present and future Yellowstone River water quality, 2) identify additional data needed to better accomplish the preceding task, and 3) provide recommended measures for improving any water quality problems noted.

Work performed for this study will be used as contribution in kind for part of the state/local match to the US Army Corps of Engineers Yellowstone River Cumulative Effects Study. The Montana Department of Environmental Quality anticipates that the principal investigator's salary for this project will be 100 percent state funded and not used as a match for any other federal grants. It is possible that some funding may come from sources that are partially federally funded and/or are already being used as matches for federal grants.

The bulk of this study will involve analysis of existing USGS data. Data from the USGS NAWQA Yellowstone study constitutes a small fraction of the USGS data available. This study will use USGS NAWQA and all other available, relevant USGS data. Data from other sources, such as Yellowstone River Watch, permitted point source wastewater dischargers, and DEQ, may also be useful. Trend analysis, comparison of measured values to state water quality standards and other literature based criteria, and data gap analysis will be performed for a number of parameters such as salinity, sodium adsorption ratio, metals, suspended solids, pathogens (bacteria) and nutrients.

The following questions will be addressed through the water quality study:

- 1) Do human activities influence Yellowstone River water quality conditions? If so, where, when, to what extent and under what environmental conditions are fish or other aquatic life impacted?
- 2) Do human activities influence Yellowstone River water quality conditions necessary to maintain agriculture, drinking water (after conventional treatment), industry, or recreation. etc. If so, where, when, to what extent, and under what environmental conditions?
- 3) Based on current trends, how is Yellowstone River water quality likely to change over the next 25 years?
- 4) What additional data are needed to better answer questions 1 through 3?

RELATIONSHIP TO OTHER STUDY EFFORTS

The water quality study overlaps with the nuisance algae/nutrient study. Parameters that overlap between this analysis and the nuisance algae/nutrient study include nutrients, dissolved oxygen levels and possibly suspended solids levels. The findings of the water quality study will be used as baseline information for the nuisance algae/nutrient study.

Additional nutrient, dissolved oxygen, and/or suspended solids information and analyses from the nuisance algae/nutrient study subsequently may be incorporated into the water quality study report.

The water quality study is not directly related to the fish or socioeconomic studies but may be of use in those areas. The water quality study will help in discussing factors affecting Yellowstone River fish and macroinvertebrate community composition. The water quality study may also reveal issues that affect human use of the river and, as a result, socio-economics.

PROPOSED STUDY TASKS

The water quality study is divided into 8 tasks. Generally, data analysis and report writing will proceed on a parameter by parameter basis. In other words, the researcher will complete tasks 2 through 7 for one parameter prior to beginning data analysis for another parameter. Prior to beginning data analysis, the researcher will prioritize the chronological order in which parameters will be evaluated.

Task 1: Collect Available Data and Compile a Database.

Available data include, but are not limited to, USGS fixed station data, point source data required to fulfill permitting requirements, and DEQ data. Data collection locations will be mapped in ArcView. All data will be compiled in Microsoft Access.

Task 2: Examine Existing Water Quality Data

Task 2.1. Compile a period of record summary table.

The table will list the time frame during which sampling occurred, the number of samples collected, and include remarks regarding sampling patterns.

Task 2.2 Evaluate data quality limitations.

Examples of attributes that may limit the utility of any given datum or data set include high reporting limits, anomalous values, unreliable analytical methods, and inadequate QA/QC. Data of this sort may still be used or used with qualifications depending on the extent of the problem.

Task 2.3 Determine if existing information indicates conditions may impair or benefit beneficial uses such as agriculture, aquatic life, drinking water, fish, industry, recreation, etc.

The researcher will compare reported values to criteria such as State of Montana numeric water quality standards, DEQ guidance, and tolerance values reported in scientific literature.

Task 2.4 Perform trend analysis.

The researcher will apply trend analysis tools such as those discussed in Helsel and Hirsch (1992) to parameters that are identified as a concern in task 2.3. This task will focus on evaluating potential changes along the river, through time, and due to fluctuations in environmental variables such as flow. The outcome will help identify

pollution sources, determine if conditions are improving or deteriorating, and determine the specific conditions under which a given water quality parameter may be a concern.

Task 3: Determine if human activities are contributing to factors revealed in tasks 2.3 and 2.4.

To the degree possible, the researcher will separate human from natural influences. Examples of useful ancillary information include wastewater discharge pollutant load measurements, land use pattern summaries, geomorphological descriptions, and irrigation return flow evaluations.

Task 4: Based on existing trends identified in tasks 2.4 and 3, project changes in water quality conditions over the next 25 years.

Since prediction of future environmental conditions typically necessitates making numerous assumptions, the results of this task will be semi-quantitative or qualitative in nature.

Task 5: Identify additional information needed to more fully complete tasks 2 through 4.

Examples of additional needed information include longer periods of record and/or additional stations for any given parameter of concern.

Task 6: Formulate recommendations to reduce or eliminate any problems discovered.

Management options will be presented for any point and/or non-point source pollution problems revealed through this study. Recommendations will typically be stream reach scale rather than specific in nature.

Task 7: Prepare a Technical Report.

The report will be stand alone and will include a title, table of contents, acknowledgements, introduction, a discussion for each parameter evaluated, conclusions, recommendations and references. As the lead entity, DEQ will be responsible for editing of the draft report. In cooperation with the Corps, the Council or representatives thereof, and other appropriate agencies and interest groups DEQ will produce, print, and distribute the final report. Results will be considered in plan formulation work and development of a comprehensive corridor plan.

Task 8: Quality Control, Quality Assurance, and Technical Review Considerations

Principal Investigator (PI) Quality Control

The PI will develop a Quality Control Plan (QCP) so that the study products meet the requirements of the scope. The QCP will include as a minimum a description of the QC process, listing of review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and Council prior to initiation of the technical study. As part of the QC process, interim peer reviews will be performed at specified milestones through

the study process as outlined in the QCP. These milestones will be identified in the QCP that will be submitted by the PI and approved by the Corps and Council. At the end of the study, the PI will complete a QC Report that documents the execution of the QCP.

Quality Assurance/Quality Control (QA/QC)

PI Quality Control (QC).

The PI will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and TAC prior to initiation of the technical study. At the end of the study, the PI will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

Quality Assurance (QA).

A QA review will be performed to ensure that the PI has met the objectives of the scope and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the TAC.

Time Line

Task 1 has already largely been completed. Tasks 2 through 4 will be completed by the end of 2004. Tasks 5 through 7 will be completed by the end of 2005. Task 8 will be completed by the end of 2007.

LITERATURE CITED

Helsel, D.R. and R.M. Hirsch, 1992. Statistical methods in water resources, Elsevier, New York.

**Yellowstone River Cumulative Effects
Study
Water Quality SOW Budget**

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Total
Total Costs	\$2,600	\$6,200	\$5,600	\$2,400	\$2,400	\$2,400	\$6,400	\$1,580	\$29,580
Labor,Benefits	\$2,400	\$6,000	\$3,600	\$2,400	\$2,400	\$2,400	\$6,000		\$25,200
Software enduser license			\$2,000						\$2,000
Other costs	\$200	\$200					\$400		\$800
QA (3% of \$31,600)								\$948	\$948
QC (2% of \$31,600)								\$632	\$632
									\$0
Non-Federal Cost Share	\$2,400	\$6,000	\$3,600	\$2,400	\$2,400	\$2,400	\$6,000	\$0	\$25,200
MT DEQ Labor & Benefits Cost Share*	\$2,400	\$6,000	\$3,600	\$2,400	\$2,400	\$2,400	\$6,000		\$25,200

Federal Cost	\$0	\$0	\$2,000	\$0	\$0	\$0	\$0	\$1,580	\$3,580
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Task Descriptions	Deliverables						
1: Collect Available Data and Compile a Database							
2: Compile a period of record table, evaluate data quality limitations, identify impacts, and perform trend analysis							
3: Determine the extent to which human activities cause problems identified in task 2							
4: Project WQ changes over the next 25 years							
5: Identify data gaps							
6: Formulate recommendations							
7: Prepare a technical report							
8: QA/QC							

*The Montana Department of Environmental Quality anticipates that the principal investigator's salary for this project will be 100 percent state funded and not used as a match for any other federal grants. It is possible that some funding may come from sources that are partially federally funded and/or are already being used as matches for federal grants.

4.0 Part F – Nuisance Algae and Nutrient Study [12-29-2003 draft]

PURPOSE

The nuisance algae and nutrient analysis will provide information for the biological aspect of the US Army Corps of Engineers cumulative effects study and for development of any necessary Yellowstone River nutrient total maximum daily loads (TMDLs). This scope of work builds on the results of a previous study performed by the United States Geological Survey (USGS) National Water-Quality Assessment Program (NAWQA). The USGS Yellowstone NAWQA study was spatially broad but screening level in nature. This study will involve more in depth evaluations of problems revealed by the USGS Yellowstone NAWQA study.

Work performed for this study will be used as contribution in kind for part of the state/local match to the US Army Corps of Engineers Yellowstone River Cumulative Effects Study. The Montana Department of Environmental Quality (DEQ) anticipates using 100 percent state funding for labor and travel costs associated with this project. The state portion is not being used as a match for any federal grants. It is possible that some funding will come from other sources that are partially federally funded and/or are already used as a match for federal grants.

Nuisance growths of filamentous green algae in streams may deplete dissolved oxygen levels when light levels are low, clog water intake structures, reduce aesthetics, and/or interfere with fishing. Nuisance filamentous green algae growths are commonly caused or exacerbated by increased nitrogen or phosphorus loads.

The results of recent assessment work performed by USGS NAWQA personnel indicate that human activities contribute to nuisance growths of algae in the middle reaches of the Yellowstone River. During August 2000, USGS personnel collected periphyton samples at 11 sites along the Yellowstone River in Montana. With the exception of two samples, the study results revealed relatively low algal standing crops. Samples collected at Billings and Forsyth yielded chlorophyll at concentrations of 797 and 100 mg/m² respectively. DEQ typically uses limits of 50 and 100 mg/m² as screening level criteria for full support of recreation and aquatic life respectively. Cladophora glomerata, a filamentous green algae common in streams subjected to cultural enrichment, constituted the bulk of algal biomass in both samples (Peterson *et. al.*, 2001).

During late August 2000, USGS personnel measured night-time dissolved oxygen down to approximately 4.5 mg/l in the Yellowstone River at Billings (Peterson and Porter, 2001). State of Montana instantaneous minimum dissolved oxygen water column standards of 8.0 mg/l and 5.0 mg/l are applicable to the Yellowstone River upstream and downstream from the Billings water supply intake (near Josephine Park) respectively. According to Vic Rigg (personal communication), seasonal drifts of senescent filamentous green algae limit or eliminate fishing opportunities in various reaches of the lower Yellowstone River. The drifts originate in the Bighorn and/or Yellowstone Rivers.

The compositions of diatom community samples collected from Yellowstone River substrate indicate that nitrogen enrichment is the probable cause of the relatively dense

algae growths in the Billings and Forsyth areas. Initial load calculations suggest the Clark's Fork of the Yellowstone and Bighorn Rivers as primary nitrogen load contributors (Peterson and Porter, 2002). Visual inspection by DEQ staff during August 2002 revealed that nutrient loads from Canyon Creek also significantly increase Yellowstone River filamentous green algae growths. Potential anthropogenic nitrogen sources include but are not limited to fertilizer, domestic animal wastes, septic leachate, wastewater treatment plant discharges, and Bighorn Lake sediments.

The approach proposed here generally follows the procedures outlined in Protocol for Developing Nutrient TMDLs (EPA, 1999). Components include problem identification, identification of water quality indicators and target values, source assessment, linkage between water quality targets and sources, allocations, follow-up monitoring and evaluation, and developing an implementation plan.

As funding provides, a contractor will complete all of the previously listed tasks up through linking water quality targets and sources. Also as funding provides, a contractor will supply the Yellowstone Conservation District Council TAC and Montana DEQ with recommendations for allocations and follow-up monitoring. If funding is not obtained to have a contractor perform this work, DEQ staff may be assigned to do so.

The nuisance algae and nutrient study task will serve to answer the following questions:

- 1) What are the extent, frequency, seasonality, and duration of filamentous green algae growths and drifts in the Yellowstone River?
- 2) What is the extent to which filamentous green algae growths and drifts interfere with beneficial uses such as water for irrigation, drinking, recreation, fish production, etc.
- 3) What is the extent to which human activities influence the algae growths?
- 4) If the study confirms human caused problems, what are possible approaches to reduce algal growths and drifts to acceptable levels?
- 5) If the study confirms natural caused problems, what are possible approaches to reduce algal growths and drifts to acceptable levels?

These questions were used in determining the primary tasks outlined in this scope of work. The following paragraphs provide a description of these tasks and how they relate to the study purposes and questions.

This study will be conducted as funding and staff resources allow. MDEQ funding and/or staff resource shortages may limit or curtail work on this project. Also, more specific study plans will be approved within DEQ before fieldwork is implemented.

RELATIONSHIP TO OTHER STUDY EFFORTS

This study effort overlaps the water quality analysis and is related to fish community response and socio-economics. Parameters that overlap between this analysis and the water quality analysis include nutrients, dissolved oxygen levels and possibly suspended solids levels. The findings of the water quality study will be used as baseline information for this study. Additional nutrient, dissolved oxygen, and/or suspended solids information and analyses from this study subsequently may be incorporated into the water quality study report.

One part of this study will involve evaluation of algal induced dissolved oxygen sag on fish. The results of the dissolved oxygen sag evaluation will indirectly relate to the fish community response study (which focuses primarily on potential effects of habitat alterations).

Another part of this study will evaluate the impacts of algal growths and drifts on fishing and water intake structure maintenance. The findings of this evaluation may be of use in evaluating socio-economic conditions along the river.

PROPOSED STUDY TASKS

The nuisance algae SOW consists of 8 major tasks, which represent distinct project phases. Task 1 provides a foundation for the project and will help narrow the scope of succeeding tasks or possibly eliminate the need for additional work. Succeeding tasks will only be performed if task 1 confirms that human activities significantly contribute to algal growths and/or drifts that impair beneficial uses. Tasks 2 and 3 may be performed concurrently. Subsequent tasks will be performed in the order listed below. DEQ will review and approve the deliverable of each task or subtask before the contractor proceeds with subsequent tasks or subtasks.

Task 1: Describe the Problem

The purposes of this task include determining the spatial and temporal distributions, speciation and density of filamentous green algae growths and drifts in the Yellowstone River; and confirming or refuting anthropogenic nutrient sources as significant contributors thereof. Subtasks include:

1.1. Collect and review available information.

Relevant available information includes but is not limited to 2 USGS Yellowstone NAWQA reports, several older DEQ reports, and USGS nutrient and flow data collected at various stations along the mainstem and tributaries such as the Clark's Fork of the Yellowstone and Bighorn Rivers. The Yellowstone NAWQA bibliography may supply citations to additional useful documents. Recent Canyon Creek drainage assessment work funded by a 319 grant also may include useful information.

1.2 Interview people who live and work along the river.

This work will focus on collecting information to determine seasonality, locations, frequency of occurrence, duration of occurrence, and intensity of Yellowstone River filamentous green algae growths and drifts. Interview subjects will include but are not

limited to industry, irrigators, fishing guides/outfitters, FWP biologists, tackle shop operators, water plant operators, etc.

1.3 Evaluate data gaps.

This task will determine additional data needs to 1) adequately define seasonality, locations, frequency of occurrence, duration of occurrence, and intensity of Yellowstone River filamentous green algae growths and drifts, and 2) determine the significance of human contributions to causative nutrient loads.

1.4 Provide a report that discusses work to date and proposes additional assessment work needed to fill data gaps.

If this report concludes that algae growths and drifts in the Yellowstone River do not significantly impair beneficial uses and/or human activities do not significantly increase causative nutrient loads, and DEQ concurs with the report's conclusions, Tasks 1.5 through 6 will not be necessary.

1.5 Upon approval of the proposed approach, conduct additional onsite assessment work as is needed and feasible.

1.6 Provide a report that details the work conducted and associated findings.

If this report concludes that algae growths and drifts in the Yellowstone River do not significantly impair beneficial uses, and/or human activities do not significantly increase causative nutrient loads, and if DEQ concurs with the report's conclusions, Tasks 2 through 6 will not be necessary.

Task 2: Develop Numeric Targets

Numeric targets may be set for nutrients, algal growth/drift intensity and extent, dissolved oxygen levels, and/or some other attribute.

2.1 Prepare a written proposal of procedures to determine the limiting nutrient and numeric targets.

2.2 Upon approval of the proposal, determine which nutrient is limiting and under which conditions; and formulate numeric targets.

2.3 Provide a report detailing findings of task 2.2.

Task 3: Assess Nutrient Sources

3.1 Prepare a written proposal of needed source assessment work.

3.2 Upon approval of the associated proposal, determine where nutrient loads originate and the contribution of each to Yellowstone River nutrient loads.

3.3 Prepare and submit a source assessment report.

Task 4: Link Targets and Sources

4.1 Prepare a written proposal of procedures for linking targets and estimating total loading capacity.

4.2 Upon approval of the associated proposal, assess linkages between sources and targets, and calculate total loading capacity.

4.3 Provide a report that details the work conducted and associated findings.

Task 5: Study Allocation of Loads

5.1 Divide the total allowable nutrient load among the known sources.

5.2 Provide a report with allocation recommendations and the rationale used in making the recommendations.

Task 6: Supply monitoring plan recommendations

6.1 Identify remaining data gaps and monitoring needs.

6.2 Supply a letter report with recommendations for monitoring work needed.

Task 7: To the extent possible, project future conditions based on current trends.

Task 8: Quality Assurance/Quality Control (QA/QC)

8.1 PI Quality Control (QC).

The PI will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and TAC prior to initiation of the technical study. At the end of the study, the PI will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

8.2 Quality Assurance (QA).

A QA review will be performed to ensure that the PI has met the objectives of the scope and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the TAC.

Time Line

Work on task 1 has already begun and will be completed by the end of 2004. Tasks 2 through 4 will be completed by the end of 2005. Tasks 5 through 7 will be completed by the end of 2006. Task 8 will be completed in 2007.

LITERATURE CITED

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**Yellowstone River Cumulative Effects
Study
Algae SOW Budget**

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Total
Total Costs	\$9,000	\$9,000	\$19,000	\$9,000	\$5,500	\$2,000	\$1000	\$3,460	\$57,960
Labor,Benefits **	\$5,000	\$8,000	\$10,000	\$6,000	\$5,000	\$2,000	\$1000		\$37,000
Travel***	\$2,000	\$1,000	\$3,000	\$1,000	\$500				\$7,500
Other (supplies and sample analyses)**	\$2,000		\$6,000	\$2,000					\$10,000
QA (3% of \$69,200)*								\$2,076	\$2,076
QC (2% of \$69,200)*								\$1,384	\$1,384
QA/QC COE funds									
Non-Federal Cost Share*	\$5,000	\$8,000	\$10,000	\$6,000	\$5,000	\$2,000	\$1,000		\$42,000
MT DEQ Labor & Benefits Cost Share	\$5,000	\$8,000	\$10,000	\$6,000	\$5,000	\$2,000	\$1000		\$42,000
Travel	\$2,000	\$1,000	\$3,000	\$1,000	\$500				\$7,500
Other (supplies and sample analyses)	\$2,000		\$6,000	\$2,000					
Federal Cost	\$2,000	\$0	\$6,000	\$2,000	\$0	\$0	\$0	\$3,460	\$13,460

* It is possible that some funding will come from sources that are partially federally funded and/or are already used as a match for federal grants.

**prior to 2004 Montana DEQ has spent nearly \$23,000 for supplies and materials and \$5,000 in labor.

***Travel expenses incurred by MTDEQ are not considered costs share dollars

<u>Task</u>	<u>Man-days</u>	<u>Labor Costs (</u>	<u>Other Costs (</u>	<u>Sub-Total</u>
Task 1. Describe the problem				
1.1 Collect and review available information	2	\$1,200	\$200	\$1,400
1.2 Interview people who live and work along the river	5	\$3,000	\$400	\$3,400
1.3 Evaluate data gaps	2	\$1,200		\$1,200
1.4 Provide a summary report and proposal	5	\$3,000	\$200	\$3,200
1.5 Collect additional data as needed	10	\$6,000	\$1,000	\$7,000
1.6 Provide a problem determination/impairment status re	3	\$1,800	\$200	\$1,400
Subtotals	27	\$16,200	\$2,000	\$18,200
Task 2. Assess nutrient sources				
2.1 Prepare a source assessment proposal	7	\$4,200	\$200	\$4,400
2.2 Collect source assessment data	15	\$9,000	\$4,000	\$13,000
2.3 Prepare a source assessment report	7	\$4,200	\$200	\$4,400
Subtotals	29	\$17,400	\$4,200	\$21,600
Task 3. Develop numeric targets				
3.1 Prepare a numeric targetsproposal	4	\$2,400	\$200	\$2,600
3.2 Formulate numeric targets	5	\$3,000		\$3,000
3.3 Prepare a numeric targets report	3	\$1,800	\$200	\$2,000
Subtotals	12	\$7,200	\$400	\$7,600
Task 4. Link targets and sources				
4.1 Prepare a target and source linkage proposal	4	\$2,400	\$200	\$2,600
4.2 Link targets and sources	10	\$6,000	\$1,000	\$7,000
4.3 Prepare a target and source linkage report	5	\$3,000	\$200	\$3,200
Subtotals	19	\$11,400	\$1,400	\$12,800
Task 5. Allocate loads				
5.1 Divide the total allowable load among the known user	5	\$3,000	\$200	\$3,200
5.2 Provide a load allocation report	3	\$1,800	\$200	\$2,000
Subtotals	8	\$4,800	\$400	\$5,200
Task 6. Supply monitoring recommendations				
6.1 Identify remaining data gaps and monitoring needs	3	\$1,800		\$1,800
6.2 Prepare a data gap/monitoring recommendation repoi	3	\$1,800	\$200	\$2,000
Subtotals	6	\$3,600	\$200	\$3,800
Total Nuisance Algae and Nutrient Analysis*				\$69,200

* Depending on the results of task 1, tasks 2-6 may not be necessary.

4.0 Part G - River Aquatic Sites Study [17-NOV-2003]

PURPOSE

Develop digital wetlands data for the Yellowstone River using the National Wetlands Inventory (NWI) wetlands classification methodology and investigate the cumulative effect of human activities along the River on the abundance and/or quality of the wetland natural resource. The digital data would then form a base layer that could be compared against historic aerial photography and mapping information and the location of regulatory permits. The wetlands mapping itself will be analyzed to compare and contrast wetlands which have obviously been impacted by human activities (i.e. transportation infrastructure). Comparing the wetland type and condition on both the riverward and landward side of an obstruction will give some general indication of the effects. Of primary importance in this study is identification of the trend the wetland resource is undergoing in response to continued human activity and to establish cause-effect relationships if and where possible.

The following questions will be addressed during this study (all within the context of a cumulative effects analysis [CEQ 1997]):

- 1 What is the current condition of the wetland resource within the Yellowstone River Corridor?
- 2 How has the wetland resource changed over time?
- 3 How do human activities influence wetland resources, such as wetland quantity, size, distribution, quality, and function?
- 4 What are the cumulative effects trends of human and natural influences on the wetlands along the Yellowstone River Corridor?
- 5 What cause-effect linkages can be established between human activities and wetland functions?
- 6 What are the risks to wetland resources of continued development within the river basin?

RELATIONSHIP TO OTHER STUDY EFFORTS

This study is closely related to the riparian characterization, geomorphic, and hydrologic analyses. These studies will provide many of the variables used to assess the cumulative effects on wetlands within the Yellowstone River corridor.

DATA NEEDS

The wetlands classification and analysis will encompass approximately 200 river miles along the Yellowstone River corridor. The study sites will correspond with the sites where other detailed physical and biological studies will be conducted. The detailed study reaches are being established based on geomorphic channel types and the 200 mile extents is intended to be representative for similar reach types elsewhere along the corridor. It is estimated that the 200 miles would cover approximately 30 USGS 1:24,000 Quadrangle Maps. The NWI classification system would be utilized to develop the wetland data coverage. Classification will involve photo-interpretation of the color infrared aerial photography obtained by NRCS in 2001. All of the data developed will be in a GIS data base format to allow public access over the Yellowstone Web page. A technical report would also be produced.

STUDY RESEARCHERS AND COLLABORATORS

The U.S. Fish and Wildlife Service, NWI office in Denver, NRCS Montana State Office (photography), NWI contractor (technical work), and Omaha District.

STUDY TASKS

- 1. Develop scope and interagency agreement with the U.S. Fish and Wildlife Service.** Select contractor having prior experience with the remote sensing vegetation classification NWI methodologies and mapping and capability to develop ArcView GIS data coverages as a new data set.
- 2. Develop digital coverages of NWI classifications for approximately 35 quads.** Photo interpretation of the existing (2001) 1:24,000 CIR orthophotoquads (overlap 25%) available from NRCS would be used to develop the draft coverage. The draft NWI coverages would then be field verified and corrected as necessary. The task will include statistical analysis of the data by geomorphic channel types and quads. The final reach locations and number of quads will be supplied by the Corps and study sponsor prior to initiation of the study.
- 3. Compare close proximity wetlands based on classification.** Compare wetlands type, quality, and function in selected areas where historic wetlands were obviously impacted by human activities. For example, compare and contrast wetlands on either side of a human obstruction (e.g. railroad grade) that were likely to have been historically connected. Develop statistics to summarize results.
- 4. Investigate the number of 404 and 310 permits affecting wetlands in the study reaches.** Acquire all of the 404 and 310 permits for the study reaches and evaluate which ones have resulted in alteration of the wetlands along the Yellowstone River corridor. Perform statistical analysis of the impacts and summarize by reach and quad.
- 5. Perform comparative analysis of new and historic aerial photos versus the new NWI wetlands classification.** A qualitative analysis of historical wetland changes by photo interpretation of historic aerial photography in contrast to the new NWI wetlands coverage will be performed. At least 3 sets of historic aerial photography will be obtained, scanned, and digitally rectified for use throughout the CES. These photos, in addition to the new high resolution aerial photography obtained as part of the topographic surveys, will be used to compare with the NWI wetlands coverage to evaluate changes in the wetland extents. The comparison will be qualitative in nature as the historic aerial photography will be black and white and probably lower resolution than the CIR used in the NWI base data classification. Summary statistics and trends will be developed by reach and quad to set the groundwork for the cumulative effects analysis.
- 6. Evaluate any relationships between the data sets and hydrologic, and structural modifications to river from human and natural activities.** Consolidate comparison data and identify any linkages and cause-effect relationships and provide numerical data that would readily illustrate these conditions. Supplemental data that will be available include: hydrologic data for both existing and historic (pre-diversions and other

depletions) conditions; physical features inventory of structures along the river; and riparian and land use inventories along the river corridor.

7. Report Preparation. A technical report with appropriate description of study area, methods, findings and conclusions will be developed. The report will include samples of the NWI data coverage charts and tables as appropriate. Assumptions used in the analysis will be documented and discussed.

8. Meetings & Coordination. This task will include coordination meetings between the study contractor, USFWS, Corps, TAC, and/or YRCDC. It is anticipated that there will be at least three meetings with the Council during the course of the study.

9. Quality Assurance/Quality Control (QA/QC).

9.1 PI Quality Control (QC).

The PI will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and TAC prior to initiation of the technical study. At the end of the study, the PI will complete a QC Report that documents the interim peer reviews (i.e. comments and responses).

9.2 Quality Assurance (QA).

A QA review will be performed to ensure that the PI has met the objectives of the scope and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the TAC.

10. General Expenses. General expenses include fees for the use of ArcView, the Geographical Information System (GIS) network, GIS personnel, and plotter will be collected, as these tools will be used while the product is being developed. All GIS data will include metadata and will be projected in Montana State Plane with a horizontal datum of North American Datum 1983 (NAD83) and a vertical datum of North American Vertical Datum 1988 (NAVD88) [units meters].

DELIVERABLES

1. Electronic NWI coverages for approximately 35 quads.

2. Technical report (hard copy and electronic form), displaying both graphically and tabularly the digital study products and statistical data.

**Yellowstone River Cumulative Effects Study
Aquatic Sites SOW Budget**

18-Nov-03

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Total
Total Costs	\$5,000	\$60,000	\$5,000	\$5,000	\$10,000	\$5,000	\$6,500	\$2,500	\$5,000	\$8,000	\$112,000
Contract Labor, Benefits, ODC	\$0	\$60,000	\$5,000	\$0	\$10,000	\$5,000	\$6,500	\$2,500	\$5,000	\$5,000	\$99,000
DNRC Labor, Benefits, Indirect, ODC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
USCOE labor, benefit, indirect, ODC	\$5,000	\$0	\$0	\$5,000	\$0	\$0	\$0	\$0	\$0	\$3,000	\$13,000
Non-Federal Cost Share	\$1,250	\$15,000	\$1,250	\$1,250	\$2,500	\$1,250	\$1,625	\$625	\$1,250	\$2,000	\$28,000
DNRC Labor,Benefits, Indirect, ODC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
YRCDC Cash	\$1,250	\$15,000	\$1,250	\$1,250	\$2,500	\$1,250	\$1,625	\$625	\$1,250	\$2,000	\$28,000
Federal Cost	\$3,750	\$45,000	\$3,750	\$3,750	\$7,500	\$3,750	\$4,875	\$1,875	\$3,750	\$6,000	\$84,000

Task Descriptions	Deliverables
1 Develop IAG with USFWS	see PMP - Appendix A
2 Perform NWI classification	assume 30 quads at \$2,000 / quad
3 Compare based on NWI classification	assume \$5,000
4 Investigate historic 404 & 310 permits	assume \$5,000 COE
5 Compare NWI w/ historic aerials	assume 20 quads at \$500 / quad
6 Evaluate relationship to human activity	assume \$5,000
7 Report Preparation	see PMP - Appendix A
8 Meetings and Coordination	see PMP - Appendix A
9 QA/QC	see PMP - Appendix A
10 General Expenses	see PMP - Appendix A
11 Travel and Coordination	See PMP - Appendix A

5.0 Socioeconomic, Cultural and Recreational Resources [11-18-2003]

PURPOSE

The first purpose of the socioeconomic research task is to identify the current and future demand for river resources and management actions by all user groups. This demand information, when paired with information on the ability of the river to supply resources, will lead to identification of problem areas where the river is unable to sustain the demands of these user groups. This demand-supply framework will lead to identification of the cumulative effects of natural events, market forces, and management actions (e.g., bank stabilization) on the ability of the river to sustain these socioeconomic activities.

The second purpose of this task is to understand local perspectives and important social and economic factors that drive demand for river resources and management actions, and the willingness of individuals and entities to accept and adopt best management practices. To solve sustainability issues, best management practices can be implemented along the river to either increase the supply or decrease the demand for river resources. For example, by increasing the efficiency of irrigation infrastructure and practices, the demand for water from the river to sustain agricultural activities decreases, which could lead to improvements along downstream reaches of the river where demand for water may be greater than supply. This information on local perspectives and factors will assist local decision makers, such as conservation districts and county commissioners, in successfully implementing best management practices along the river.

This study includes the following three research objectives:

1. Identify and quantify the current demand for river resources and management actions that are necessary to sustain the needs of the following direct user groups:
 - Agriculture – including irrigated crops, grazing, feedlots, dairies, beet refineries, and other agricultural processing;
 - Residential land development – including subdivisions and ranchettes;
 - Industrial – including petroleum refineries, electric power plants, and other industrial facilities that directly use river services;
 - Municipal – including drinking water, sewage treatment, and storm water runoff;
 - Transportation – including highways and railroads;
 - Recreation – including fishing, floating, hunting, and urban parks; and
 - Cultural – including historic, cultural, and educational activities.
2. Forecast expected growth in demand for river resources and management actions over the next ten years to sustain the needs of the direct user groups listed above under the first objective.
3. Develop an understanding and appreciation of local perspectives and important social and economic factors that underlie decisions regarding

- residential development in the floodplain,
- bank stabilization,
- irrigation infrastructure,
- industrial development, and
- public infrastructure.

IMPORTANT CONSIDERATIONS

- Guiding principles for designing the scope of work for this cumulative effects and best management practices study include limiting the scope to (a) direct users of river resources and (b) the ability of the river to sustain these different uses. While it is recognized that the socioeconomic activity supported by river resources is an integral part of communities that may be adjacent to the river corridor, the core purpose of this study is to identify the cumulative effects on the river's ability to sustain socioeconomic activities that lie in the river corridor and directly depend on river resources. In doing so, this study provides the necessary inputs to understand the sustainability of broader socioeconomic activities in adjacent communities that are linked to this direct activity.
- Demand for the following river corridor resources and management actions should be included in this study: productive land, water quality and quantity, water diversions, bank stability, riverbed stability, effluent or byproduct sink, stream flow control, land and river habitat, fish populations, wildlife populations, access points, bridges, and historic locations.
- Many important management decisions are made locally and individually, often with county oversight. For this reason, research analysis and results must be local to counties along the Yellowstone River. Furthermore, results should be presented such that decision makers can aggregate results across (a) user groups within a county, (b) counties within a user group, (c) reaches within a user group, and (d) resources and management actions within a reach, user group, and county. In no case should results be disclosed in a manner that violates private rights.
- All collected data and user group characterizations for this study should be formatted in a manner that is consistent with the requirements for inclusion as layers in the Natural Resource Information System (NRIS). The standard projection for an NRIS layer is Montana State Plane NAD 83. All data layers must be compatible with both ArcView 3.X and 8.X

RELATIONSHIP TO OTHER STUDY EFFORTS

The socioeconomic analysis is one component of the integrated cumulative effects analysis. This study component contributes quantification and characterization of the demand for river resources and management actions, such as the demand for water supply and bank stabilization measures. The socioeconomic study component also identifies barriers to adoption of best management practices that are identified in the other tasks of this project.

REQUIRED STUDY TASKS

The scope of work includes five tasks. The first task relates to current and future demands of the seven user groups in the Yellowstone River corridor. The second task relates to the objective of developing an understanding and appreciation of local perspectives and important socioeconomic factors that motivate decisions regarding the demand for resources and the adoption of management practices. The third task covers meetings and coordination with other study groups in this project for the selected contractor. The fourth and fifth tasks describe the Army Corps of Engineers review process and attendance at meetings.

1. User group characterization and estimation of baseline and future demand for river resources and management actions.

The objective of this task is to provide baseline information that leads to identifying cumulative effects as well as problems with and opportunities for meeting the resource requirements necessary to sustain all user groups in the river corridor. The future forecasting horizon is 10 years for all user groups. Data needs for all user communities include current and future socioeconomic activity, such as number of entities, employment, sales turnover, value added, etc., as well as the specific variables defined below under each user community subtask.

1.0 GIS data structure for socioeconomic data

The first subtask is to design data structures for each of the seven user communities that link to physical features on the base geographic layers. The data structures will be in ArcView file format that meets specifications for inclusion in NRIS. The following steps will be followed to design the data structure for each user community:

1. Define data fields for resource requirements and management practices. These fields determine potential physical features to link to on the base geographic layers. For example, irrigated crop land has a resource requirement for acre-feet of water, which in turn should be linked to a diversion point on the river that supplies the required water. These resource requirement and management practice fields must have a consistent definition across user communities in order to meet the specification for aggregation across user communities.
2. Define geographic fields that match the definitions on the NRIS base geographic layers. These geographic fields provide the link between the physical feature on the geographic map layers and the demand for river services and management practices. In the example used above regarding irrigated crop land, the socioeconomic agriculture database would have a field defined for diversions, with the field being populated with the identifier code definitions for diversions used in the NRIS geographic database.
3. Define a consistent set of socioeconomic characterization fields across user community databases. In order to meet the requirements for aggregating across user communities for any specific reach of the river, the data structures across user communities must use a consistently defined set of fields for data such as employment, economic output, economic value added, etc.

4. Define unique user community fields. Decision-makers and citizens will be seeking information that is specific to each of the seven user communities, such as acres of irrigated cropland for agriculture and number of users at an access point for recreation. In this step, these unique fields for each of the user communities will be defined.

1.1 Agriculture

Data needs may include current and future irrigated acreage, crop mix, crop water usage requirements, crop water quality requirements, acres of grazing land, productivity of grazing land, feedlot, dairy, and agricultural processing water usage and effluent discharge, number of diversions, and understanding of water use legal and institutional situation.

Reaches: Entire river corridor.


1.2 Residential land development

Data needs may include current and future development trends and forecasts by acres within corridor broken down by riverfront versus non-riverfront and septic versus sewer system, the density of development, value of housing and land, type of acreage (e.g. productive, habitat, floodplain), domestic water source, and demographic and population trends and forecasts.

Reaches: Park County to Pompey's Pillar, Miles City area, and the Glendive area.

1.3 Industrial

Data needs may include current and future water usage per production unit, number of annual production units, discharge per production unit, number of diversions, and understanding of water use legal and institutional situation.

Reaches: Direct industrial users in the entire river corridor. 

1.4 Municipal

Data needs may include current and future number of intakes, water usage per capita, water usage per intake, water return percentage, untreated runoff, number of plants, population, and number of commercial and industrial businesses (excluding direct users of river services that are included in 1.3).

Reaches: Entire river corridor.

1.5 Transportation.

Data needs may include current and future highway and railroad miles of encroachment, bridges, usage, and abandoned infrastructure.

Reaches: Entire river corridor.

1.6 Recreation

Data needs may include current and future fishing days, hunting days, floating days, park usage, take per day for fishing and hunting, flow threshold for floating, acreage and available trails for parks, accesses per fishing day, and accesses per floating day.

Reaches: Entire river corridor.

1.7 Cultural

Data needs may include historic and prehistoric locations, and current and future visitor days on developed sites, activity days for educational and cultural events, and access points. Data needs include Native American sites and activities that are related to the Yellowstone River corridor.

Reaches: Entire river corridor.

1.8 Compile, analyze, and aggregate the demand for river resources and management actions across user groups.


The purpose of this subtask is to provide an overall picture of the demand for river resources and management actions across all socioeconomic activities for the entire Yellowstone River corridor. The deliverables from the prior seven subtasks are inputs.

The matrices by user group will be aggregated and statistics prepared by type of river resource and management action across user groups and counties. A briefing that assimilates the information collected in Subtasks 1-7 will be prepared and presented to the public.

Task 1 Deliverables

1. Seven attribute data table structures in ArcView format, one for each of the seven user communities.
2. Matrix of current and future resource requirements by resource and county in file format specified by the Project Delivery Team (PDT);



3. Matrix of current and future demand for management actions by county in file format specified by the PDT;
4. User group socioeconomic characterization workbook and brief. The workbook should be in Microsoft Excel format and the brief should be in Microsoft Powerpoint format. The socioeconomic characterization workbook should include information on current and future economic activity, such as number of entities, employment, sales turnover, value added, etc. and social information on user groups so that the cumulative effects analysis can define the socioeconomic impacts. The briefing should include this information in the form of charts and maps.
5. Raw data with metadata in file format specified by the PDT;
6. GIS data layers and metadata for each user community that includes resource requirements, demand for management actions, and socioeconomic characterization attributes in ArcView file format that meets specifications for inclusion in NRIS;
7. Technical report that documents methodology and results.
8. Public presentation of findings.

Research Partners: (1) Roger Otstot, US Bureau of Reclamation, Billings office; (2) Tim Bryggman, Montana Department of Natural Resources and Conservation; (3) Scott Rickard, MSU-Billings Center for Applied Economic Research; (4) other state and local agencies as identified by partners. 

2. Identify and understand local social and economic factors that determine the demand for river resources and management actions and the acceptance and adoption of best management practices.

The objective of this task is to aid in the acceptance of bank stabilization and water management practices and help conservation districts and local decision makers successfully implement these practices with local individuals and entities. This task will include a study of the socioeconomic motivations behind the demand for residential, industrial, and municipal infrastructure development in the floodplain, the demand for bank stabilization and barriers to adopting best management practices, and the demand for water supply and barriers to adopting efficient irrigation and water consumptive technologies.

The research design will include the following user groups and reaches:

- agriculture – sample of users in the lower reach (to overlap with geomorphology and biology scopes of work to the extent possible). 
- residential land development – samples in the upper reach and Billings metro area (to overlap with geomorphology and biology scopes of work to the extent possible). 
- industrial – census of all direct users, and
- municipal – census of all users.

Task 2 Deliverables

1. A report that provides (a) a detailed description and quantification where appropriate of the socioeconomic motivations behind the demand for selected river resources and management practices by user group and reach, and (b) documentation of technical methods.
2. A briefing that assimilates, summarizes, and presents the findings to the public.

Research Partners: Scott Rickard, MSU-Billings Center for Applied Economic Research.

3. Meetings and coordination with study team.

The socioeconomic task is part of the larger cumulative effects study. The contractor and participating research partners are expected to coordinate with the study team as defined in the Project Management Plan as appropriate. This coordination shall include a kick-off meeting prior to beginning the study and attendance at quarterly Technical Advisory Committee meetings to be held at a location in the river corridor (typically Billings, MT).

4. Quality Control / Quality Assurance (QC/QA).

4.1 PI Quality Control

The PI will develop a Quality Control Plan (QCP) to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted by the PI and approved by the Corps and TAC prior to initiation of the technical study. At the end of the study, the PI will complete a QC Report that documents the interim peer reviews (i.e. comments and responses)..

4.2 Quality Assurance (QA)

A QA review will be performed to ensure that the PI has met the objectives of the scope and has followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. This QA review will be conducted by the Corps and the TAC.

5. PDT Travel

The socioeconomic study task is anticipated to take two years to complete. This item includes travel and per diem cost for attending 4 coordination meetings for the socioeconomic study task (1 kick-off, 2 in-progress, 1 complete) and 4 TAC meetings (2 per year), preparation for these meetings, and completion of follow-up tasks after each meeting. Also, included is the cost of coordinating socioeconomic study tasks with the other tech study tasks (h&h, biological, geomorph, etc...).

Yellowstone River Cumulative Effects Study
Socioeconomic SOW Budget

	Task 1	Task 2	Task 3	Task 4	Task 5	Total
Total Costs	\$262,500	\$60,000	\$36,600	\$15,000	\$10,320	\$384,420
Contractor Labor,Benefits,ODC, Indirect	\$211,600	\$55,000	\$18,000	\$9,000	\$0	\$293,600
DNRC Labor,Benefits,ODC	\$8,400	\$0	\$1,600	\$0	\$0	\$10,000
USBR Labor,Benefits,ODC,Indirect	\$30,000	\$0	\$2,000	\$0	\$0	\$32,000
ACOE Labor,Benefits,ODC,Indirect	\$12,500	\$5,000	\$15,000	\$3,000	\$0	\$35,500
ACOE Travel					\$10,320	\$10,320
Non-Federal Cost Share	\$18,400	\$55,000	\$1,600	\$3,000	\$0	\$78,000
DNRC Labor & Benefits Cost Share	\$8,400	\$0	\$1,600	\$0	\$0	\$10,000
YRCDC Cash	\$10,000	\$55,000	\$0	\$0	\$0	\$65,000
YRCDC in-kind	\$0	\$0	\$0	\$3,000	\$0	\$3,000
Federal Cost	\$244,100	\$5,000	\$35,000	\$12,000	\$10,320	\$306,420

Task Descriptions	Deliverables
1 User community characterization	see Project Management Plan
2 Local socioeconomic BMP factors	see Project Management Plan
3 Contractor coordination/meetings	see Project Management Plan
4 QC/QA	See PMP
5 PMT travel	PMT attendance and participation at meetings